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FINAL

ENVIRONMENTAL IMPACT REPORT/
ENVIRONMENTAL IMPACT STATEMENT
FOR THE

HAYDEN HILL PROJECT
LASSEN COUNTY, CALIFORNIA

VOLUME I

September 1991

Lassen County
707 Nevada Street
Susanville, California 96130

USDI BLM - Susanville
705 Hall Street
Susanville, California 96130

USDA-Modoc National Forest
44 North Main Street
Alturas, California 96101

Applicant:

Lassen Gold Mining, Inc.
P.O. Box 1028
Susanville, California 96130

Prepared By:

Steffen Robertson and Kirsten
(U.S.), Inc.
1755 East Plumb Lane, Suite 241
Reno, Nevada 89502

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THE WILDERNESS SOCIETY

CALIFORNIA/NEVADA REGIONAL OFFICE

August 25, 1992

Mr. John Bosworth
USDI BLM - Susanville
705 Hall Street
Susanville, CA 96130

re: Lassen Gold Mining, Inc. Facility
Hayden Hill, California

Dear Mr. Bosworth:

As you know, The Wilderness Society commented on the DEIS/EIR for the Hayden Hill Mine. We recently learned that the project was initiated prior to the Record of Decision (ROD) being issued and that diesel generators, rather than power line electricity as described in the EIS/EIR, has been in use.

The EIS/EIR proposed the use of electric power lines and specifically rejected the use of diesel generators for the project's power. The final EIS/EIR (2-77) states in the section titled Power Supply Alternatives, "On-site power generation was an alternative for the Project. Although this option would alleviate the need for constructing power lines, the noise, potential air emissions, and increased fuel storage that would occur using generators would constitute unnecessary additional environmental impacts."

Thus, it was disturbing to find that Lassen Gold Mining, Inc. (LGMI) has received a Notice of Violation from the Environmental Protection Agency citing LGMI for building and using diesel generators without the required air permits. We had assumed that the information presented in the EIS/EIR documents that are sent to us accurately describe the proposed operations and their environmental impact.

According to the EPA Notice of Violation, diesel generators are being used to power the project without permits and a supplemental EIR. The project operator has a legal duty to abide by the approved plan of operations described in the EIS/EIS, and the BLM has a responsibility to ensure that they do so. The use of these generators is a significant deviation from the plan of operations described in the EIS/EIR. The fact

HAYDEN HILL PROJECT

LASSEN COUNTY, CALIFORNIA

FINAL EIR/EIS
State Clearing House No. 89020079

Abstract:

The Hayden Hill Project (Project) is a proposed open pit gold and silver mine located in northern Lassen County, California. The Project site is comprised of approximately 2800 acres of private, BLM and U.S. Forest Service land. The operation would use conventional heap leach and milling processes to recover metal values from a shallow epithermal deposit. Ore would be processed at a rate of approximately 6 million tons per year for eight years. At Project completion approximately 950 acres would be disturbed. Issues identified through the public scoping process and evaluated in this document include geology, topography, soils, vegetation, wildlife, water resources, air quality, socioeconomics, land use, cultural resources, visual resources, transportation, recreation and noise. Potential adverse impacts to the environment would be mitigated to acceptable levels through regulatory requirements and through measures incorporated in the Project planning and design.

Actions Required:

Bureau of Land Management: Approve Mining Plan of Operations and Reclamation Plan.
Lassen County: Approve Conditional Use Permit, Mining Reclamation Plan, and Hayden Hill Resource Plan; Cancellation of the Williamson Act Contract.
U.S. Forest Service: Approve Ancillary Right-of-Ways and Well Permits.

The final report on the proposed Hayden Hill Project open pit heap leach and mill gold and silver mine has been completed and is attached for your information. The report includes comments and recommendations received on the Draft EIR/EIS, a list of commentors, responses to these comments and other information. Other information on the Project are on file available for public review at the County, BLM and USFS offices listed below.

Lassen County Planning Department
707 Nevada Street, Room 236
Susanville, California 96130
Attention: Merle Anderson
(916) 257-8311

USDI BLM-Susanville
705 Hall Street
Susanville, California 96130
Attention: John Bosworth
(916) 257-5381

USDA - Modoc National Forest
441 North Main Street
Alturas, California 96101
Attention: Randall Sharp
(916) 233-5811

Applicant:
Lassen Gold Mining, Inc.
Hayden Hill Project
P.O. Box 1028
Susanville, California 96130
(916) 257-2411

Prepared By:
Steffen Robertson and Kirsten (U.S.), Inc.
1755 East Plumb Lane, Suite 241
Reno, Nevada 89502
Attention: Tom Williams
(702) 786-3225

This document has been prepared by Steffen Robertson and Kirsten (U.S.), Inc., an independent consulting firm, under the direction of the Lassen County Planning Department, the USDI Bureau of Land Management and the US Forest Service. A disclosure statement indicating Steffen Robertson and Kirsten has no financial or other interest in the Hayden Hill Project has been filed with the BLM and Lassen County in accordance with Federal regulation 40 CFR 1506.5(c).

Dear Reader:

The final report evaluating the potential environmental consequences of the proposed Hayden Hill Project has been completed and is attached for your information. This Final Environmental Impact Report/Environmental Impact Statement (EIS/EIR) is a revision of the Draft EIR/EIS that was previously distributed and should be used in place of that document.

The proposed Hayden Hill Project would be operated as an open pit heap leach and mill gold and silver mine located in Northern Lassen County. The Project site is comprised of public lands administered by the Bureau of Land Management, the Modoc National Forest, and private lands under the jurisdiction of Lassen County.

The Final EIR/EIS will be used together with economic, social and technical information by the BLM, USFS and County to independently decide on the discretionary actions being requested. The BLM and USFS will prepare Records of Decision that will be available in early November, 1991. The County will make a decision following a public hearing to be scheduled in September, 1991.

Further information regarding the dates and times of these activities may be obtained by contacting:

Lassen County Planning Department
707 Nevada Street, Room 236
Susanville, California 96130
Attention: Merle Anderson

USDI BLM - Susanville
705 Hall Street
Susanville, California 96130
Attention: John Bosworth

USDA-Modoc National Forest
441 North Main Street
Alturas, California 96101
Attention: Randall Sharp

Comments on the environmental document or the Project will be accepted by the BLM and USFS through November 4, 1991. Testimony with regard to the Project may be submitted to the County in writing prior to the County public hearing, or orally during the public hearing. We appreciate your interest in this Project and your commitment to participating in the review process.

Sincerely,

Robert K. Sorvaag
Environmental Review Officer
Lassen County Planning Department

Herrick E. Hanks
District Manager
BLM - Susanville District

Susan J. Stokke, Acting
for Douglas G. Smith
Forest Supervisor
Modoc National Forest

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BUREAU OF LAND MANAGEMENT

HAYDEN HILL PROJECT FINAL EIS/EIR

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P.O. BOX 25047
DENVER, COLORADO 80225

Ed Hastey — September 17, 1991
Ed Hastey, State Director — Date
Lead Federal Agency

SUMMARY

I Introduction

The Hayden Hill Project (Project) is a proposed open pit mining operation with heap leach and mill processing facilities. The Project is located west of State Highway 139, in northern California, approximately 50 miles northwest of Susanville, California. The Applicant is Lassen Gold Mining, Inc. (LGMI), which is a subsidiary of Amax Gold Inc.

This Environmental Impact Report/Environmental Impact Statement (EIR/EIS) has been prepared by Steffen Robertson and Kirsten (U.S.), Inc. (SRK) in compliance with the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA), and the regulations found in 40 CFR 1502.10(b) and 40 CFR 1502.13. The document will be used by Lassen County (the lead CEQA agency), the Bureau of Land Management (BLM) (the lead Federal agency) and the United States Forest Service, Modoc National Forest (USFS) to evaluate the environmental impacts of the Proposed Action and its alternatives, including the No Action Alternative. The EIR/EIS will be used to consider approvals which will permit the construction, operation, reclamation and closure of the Project.

This chapter provides a summary of the findings of the EIR/EIS. The reader is referred to the full document or the specific chapter in question for a more detailed presentation of each topic. The organization of the main content of this EIR/EIS is as follows:

Volume I

- Chapter 1; Introduction
- Chapter 2; Alternatives Including the Proposed Action
- Chapter 3; Description of the Existing Environment
- Chapter 4; Environmental Consequences
- Chapter 5; Environmental Impacts and Mitigation, Hayden Hill Resource Plan
- Chapter 6; Consultation and Coordination

Volume II

- Chapter 12; Comment Letters and Responses
- Chapter 13; Index to Responses
- Appendices

The baseline studies were conducted by subcontractors and consultants to LGMI and SRK. A listing of these subcontractors and consultants is provided in Chapter 8.0. Copies of the original baseline studies are available for inspection at the Lassen County Planning Department.

Public Scoping Process

A Notice of Preparation (NOP) of an EIR/EIS was published in the Federal Register on November 2nd, 1989. The public scoping process was initiated by Lassen County, the BLM and the USFS in two meetings held in early 1990. The public was notified of these meetings through direct mailings of notices and published announcements. Lassen Gold Mining, Inc. participated in these meetings by presenting a description of the proposed Project. The objective of the meetings was to provide the general public and local, State and Federal agencies the opportunity to submit verbal and written comment on the Project.

The public scoping meetings and agency responses to the Project identified the following list of primary concerns:

- Operations: A number of the respondents were concerned about the mining plan and whether a full range of alternatives would be considered in the EIR/EIS.
- Cyanide Heap Leaching Process: A number of the respondents were concerned about the hazards of cyanide use. Concerns included transportation issues, cyanide leakage, cyanide pond enclosure measures, wildlife mortality, water quality protection and spill contingency planning.
- Water Quality: A number of respondents were concerned about the long and short term protection of both surface and groundwater, what the potential for acid rock drainage (ARD) would be on the site and how streams and springs on and near the site would be protected.
- Reclamation: A number of respondents identified long term productivity concerns for the Project area. These concerns included the process for rehabilitation of the entire Project site, future monitoring, reclamation plan goals and the determination of reclamation success.
- Socioeconomics: A number of questions and concerns were raised regarding the impacts of the Project on local services, housing, property values and surrounding land uses.
- Wildlife: A number of respondents were concerned about the potential impacts and mitigation efforts related to wildlife mortality and habitat. The presence and status of any protected species were asked to be identified and addressed.

- Grazing: Several respondents asked how the Project would impact existing livestock grazing and on-going lease agreements.

- Other Issues: Respondents also identified concerns regarding air quality, noise, transportation, cultural resources, revegetation, soil reclamation, visual effects, recreation and cumulative impacts.

As a result of the scoping process, the following topics were identified as potential issues and evaluated in detail in the EIR/EIS:

- Geology and Topography
- Soils
- Vegetation
- Wildlife
- Water Resources
- Air Quality
- Socioeconomics
- Land Use
- Cultural Resources
- Visual Resources
- Transportation
- Recreation
- Noise

Joint Steering Committee

In addition to comments received from the public scoping sessions, numerous Joint Steering Committee meetings were held. These meetings were led by the Lassen County Planning Department and were attended by representatives of the USFS, BLM, SRK and LGMI. Representatives from the California Department of Fish and Game (CDFG) also attended a number of the meetings. Representatives from the California Central Valley Regional Water Quality Control Board (CRWQCB) were invited to and attended several of the meetings.

During these meetings, agency representatives further clarified their comments and concerns regarding the Project. The Applicant responded to questions, explained the status of on-going studies and received information regarding agency concerns.

A scoping document was prepared at the request of the Joint Steering Committee. The scoping document identified the initial areas of concern, presented preliminary alternatives to the Proposed Action and outlined additional baseline information needed to prepare the Draft EIR/EIS.

The Joint Steering Committee directed the response to comments received on the Draft EIR/EIS and the preparation and distribution of the Final EIR/EIS.

II The Proposed Action

Hayden Hill contains a shallow-level epithermal gold and silver deposit. Two distinct zones of economic mineralization include the Lookout Zone which extends north-south across the summit of Hayden Hill, and the Providence Zone which is approximately 1,000 feet southwest of the Lookout Zone.

Mining Operation

The configuration of the ore zones would necessitate the mining of the two adjacent ore zones within one open pit mine. Conventional open-pit mining methods, including drilling, blasting and a truck/loader operation, would be utilized to extract ore, and remove overburden and waste material. Approximately 45.3 million tons of ore, including 9.6 million tons of millable grade material and 35.7 million tons of heap leach material, and 85.7 million tons of waste rock, will be mined from the pit. An annual production rate of 1.3 million tons of millable material and 4.7 million tons of heap leach material would be maintained. The waste rock to ore stripping ratio is approximately 1.9 to 1. Mining activities are proposed to last for approximately 8 years, and long-term personnel requirements are expected to average 210 full time employees.

Plant growth media will be stripped from all disturbed areas to a minimum depth of 12 inches where available, and stockpiled. The 85.7 million tons of waste rock will be hauled to a waste rock dump located on the north side of Hayden Hill.

Ore Processing Facilities

Ore processing facilities will include a preparation area with crushing equipment, an ore stockpile area, one heap leach pad, a mill, solution containment ponds, one tailings impoundment, and a metals recovery system. Lower grade ore will be leached with a dilute sodium cyanide solution. Higher grade ore will be milled, utilizing a carbon-in-pulp (CIP) circuit.

A double liner system and leak detection system is designed for the heap leach facility and for the processing ponds. The cyanide heap leach facilities are designed as a zero discharge (or closed) system.

Tailings from the mill will be deposited in a lined impoundment located near the mill. The impoundment facility is designed to ultimately contain approximately 9.6 million tons of tailings.

Monitoring

Monitoring to detect any chemical leakage and any adverse environmental effects will be ongoing throughout the life of the operation, during closure, and for a post closure period. Both surface water and groundwater are currently being monitored to develop baseline information. Sampling and monitoring stations have been established and monitoring from these stations will be ongoing throughout mine life as well as during and following closure.

Ancillary Facilities

Hayden Hill Road, the main access to the mine site, will be upgraded to accommodate increased traffic. Haul roads and service roads will be constructed and/or existing roads improved. Electrical power will be provided by a three-phase 69 kilovolt (KV) overhead transmission line extending from the Surprise Valley Electrification Corporation (SVEC) substation near Adin, approximately 17 miles to the north. The power demands for the Project are estimated to be 9,500 kilowatts (KW) connected load.

The proposed mining and processing operations will require an estimated maximum fresh water supply rate of 1,000 gallons per minute (gpm). The primary mine water supply source will be groundwater from well fields in the Preston Canyon and Bunselmeier Springs areas.

Reclamation

Approximately 950 acres will be directly impacted by the Project. Reclamation procedures have been designed for the semi-arid climate and specific soil conditions of the Project area, and will be modified as field trials and test plots provide additional data. Restoration (the exact or nearly exact replacement of the existing natural communities) is uncertain. However, use of the information derived from the ongoing studies and the application of the proposed reclamation techniques for this area, including preservation of soil materials, stabilization of disturbed areas and replacement of stockpiled topsoil, should result in successful reclamation to an appropriate land use. The post-mining land use for the Project area is proposed to be livestock grazing, watershed protection, wildlife habitat, recreation and minerals exploration.

Hayden Hill Resource Plan

The Hayden Hill Resource Plan is an amendment to the General Plan which was prepared for Lassen County to provide updated guidelines for development of mineral resources at Hayden Hill. The Resource Plan contains goals, policies and objectives specifically for development of mineral resources at Hayden Hill. The County will use the Resource Plan to evaluate the Project proposed by LGMI, as well as any future mineral extraction development proposals at Hayden Hill.

The potential impacts of implementing the Resource Plan were assessed for the following subject areas:

- Geology
- Soils
- Wetlands
- Aquatic biology
- Air quality
- Population
- Education
- Law enforcement
- Health services
- Land use
- Visual resources
- Recreation
- Topography
- Vegetation
- Wildlife
- Water resources
- Employment
- Housing
- Water and sewer service
- Fire protection
- Solid waste disposal
- Cultural resources
- Transportation
- Noise

It was assumed that the Project represents a maximum-impact scenario. Also, it was assumed that any other proposed mining project would not involve significantly greater impacts than described in Chapter 2, Alternatives Including the Proposed Action, and Section 4.2, Environmental Consequences of the Proposed Action, of this EIR/EIS. Potential environmental impacts of implementing the Resource Plan were, in many cases, similar to impacts identified for the Project. Mitigation measures for the Resource Plan are changes to the goals, policies and objectives of the Resource Plan.

The Resource Plan project description, environmental impacts and mitigation are combined in Section 5.0 of this document. Table 5.4-1 summarizes the environmental impacts and recommended mitigation measures for the Resource Plan. Implementation of the Hayden Hill Resource Plan is not expected to result in any significant environmental impacts that could not be mitigated to a less than significant level.

Cancellation of the Williamson Act Contract

A petition for the cancellation of the Williamson Act agricultural preserve contract as it applies to 658 acres affected by the Project has been submitted to the County. The County has acknowledged receipt of the request. A decision will not be made until the Project EIR/EIS is certified.

III Alternatives to the Proposed Action

Alternatives to the Proposed Action have been developed in response to the issues, concerns and opportunities (ICOs) discussed above. These alternatives are divided into two categories; alternatives considered but eliminated from further consideration, and alternatives considered in detail.

Alternatives Eliminated from Further Study

The NEPA and CEQA regulations do not require that alternatives eliminated early in the EIR/EIS process, due to engineering design, economic feasibility and environmental impact, be included in the impact analysis. However, NEPA and CEQA do require their presentation to provide a complete picture of the alternatives considered. They are presented, with a short explanation for their elimination, in Chapter 2.0.

Alternatives Considered in Detail

Based on review of the possible alternatives to the Proposed Action, nine alternatives were identified that may provide the potential to reduce the level of environmental impact resulting from implementation of the Project. As a tenth alternative, the No Action Alternative has also been considered in detail. The following subsections briefly describe each of these:

No Action Alternative

The No Action Alternative is considered as a requirement of NEPA and CEQA regulations. This alternative would eliminate from consideration the recovery of the mineral resource proposed by the Applicant. The land would not be disturbed and previous disturbance would remain. This alternative would eliminate those negative environmental impacts which the Project would generate.

Pit Backfilling Alternatives

It is planned in the Proposed Action to place all of the waste rock in one dump located on the north side of Hayden Hill. To analyze the effects of backfilling the pit and reducing the size and impact of the waste rock dump, two alternatives are proposed which consider partial and complete backfilling of the pit. These alternatives are summarized below:

Comprehensive Backfilled Pit Alternative - This alternative would require the backfilling of the pit. Because of the nature of hard rock open pit mines, backfilling could not commence until after completion of mining, extending the Project life. The waste rock would still be placed in the same waste rock dump area planned for the Proposed Action, and the disturbed area would remain the same. After backfilling, the waste rock dump would be eliminated and the disturbance reclaimed.

Partially Backfilled Pit Alternative - This alternative would require the backfilling of a portion of the Providence zone of the pit. This would require a phased mining operation in which the Providence zone would have to be completely mined out before waste material from the Lookout zone could be deposited back into the Providence zone. This type of sequential mining may be logistically difficult. The resulting waste rock dump would cover the same acreage as the Proposed Action, but would be lower in height and total volume.

Waste Rock Dump Design Alternatives

Benching the waste rock dump from the top to the 5750-foot elevation level is planned for the Proposed Action. Below this elevation, the waste rock dump would be the natural angle of repose. The flat bench areas would be reclaimed. Two alternatives for waste rock dump design are summarized below:

Complete Benching Alternative - This alternative would require the waste rock dump to be benched all the way to the toe of the dump. This alternative would eliminate the long angle of repose slope beneath the 5750 foot elevation. The waste rock dump of the Complete Benching Alternative would affect approximately 21 acres more area than the Proposed Action dump.

The Smoothed Waste Rock Dump Alternative - This alternative would require the benches on the waste rock dump be smoothed out after completion of mining, and the entire dump be revegetated instead of just the flat bench surfaces. This alternative would increase the Project life by one or two years. Approximately 53 more acres would be affected by this alternative.

Facilities Location Alternative 3

The location of the heap leach pad planned for the Proposed Action would require the covering of areas potentially defined as wetlands associated with seeps, a manmade impoundment and pools. Facilities Location Alternative 3 is intended to avoid the impact to approximately 4.3 acres of these wetlands by avoiding the manmade impoundment.

Power Supply Alternative

It is planned in the Proposed Action for SVEC to install, own, and maintain the power transmission line to be built from Adin to the Project site. The alternative would require LGMI to install, own, and maintain a portion of the power line. This alternative would reduce the potential for growth induced impacts caused by the expansion of electrical power in the area, since LGMI could remove a portion of the line after Project closure and would not be obligated to provide power to residents.

Fire Tower Alternative

The Implementation of the Proposed Action would require the removal of the Hayden Hill fire lookout tower. It is planned in the Proposed Action to dismantle and store the fire tower on-site until ownership can be transferred to an appropriate entity. A new fire lookout would be built on Snag Hill, located nine miles west of Hayden Hill. The alternative to storing the fire tower on-site is to relocate it at the time of removal to the Bieber Museum.

Enclosed Cyanide System Alternatives

The Proposed Action includes plans to store cyanide-bearing solution for the heap leach facility in ponds which are fenced and covered with netting. To attempt to reduce the possibility of avian or wildlife mortality, two alternatives for cyanide containment are proposed. These alternatives are summarized below:

> Floating Cover Alternative - This alternative, if implemented, would require the process solution ponds be covered by floating covers. The only exposed process solution would be during the spray deployment system at the heap leach pad (the Applicant proposes to use drip deployment in conjunction with spray). Floating covers have not been successfully utilized in areas where large amounts of snowfall are common. Floating covers represent an untried technology for application in this climate.
>
> Enclosed Process Solution Tanks Alternative - This alternative, if implemented, would require that concentrated process cyanide solutions be stored in enclosed steel tanks. The tanks would be located, in an excavated area below grade to allow gravity flow of solutions, in a lined and bermed area sized large enough to contain the enclosed solutions. A lined pond, with netting or a floating cover similar to the Floating Cover Alternative, would still be necessary to contain run-off from the heap leach pad during storm events. Process solutions would be exposed during the spray deployment of solutions on the heap leach pad. This alternative combines systems which individually represent unproven technology in this climate. Additional land disturbance is also required.

The BLM and USFS Preferred Alternative/CEQA Environmentally Superior Alternative

The preferred alternative consists of the Proposed Action with the following exceptions:

The waste rock dump on the north side of the site should follow the Complete Benching Alternative (Section 2.3.1.3) as opposed to the partially benched waste rock dump of the Proposed Action. The erosion potential is less and the ability for reclamation is greater. The additional 20 acres of disturbance of Jeffrey Pine/Mountain Shrub vegetation is insignificant in the scope of the Project.

The power supply line will be installed, maintained and owned as outlined in the Power supply Alternative (Section 2.3.1.5). This alternative limits growth inducing impacts in the power corridor area.

The fire tower will be relocated to the Bieber Museum. The Fire Tower Alternative is described in Section 2.3.1.6 and is preferred over the Proposed Action for its benefit to cultural and recreational resources.

IV Summary of the General Environmental Setting

The Project is located in an area of low volcanic hills along the western margin of the Modoc Plateau physiographic province. The elevation ranges from 4,700 feet in Preston Canyon, north of the Project area, to 6,300 feet at the summit of Hayden Hill. The climate is semi-arid with warm summer days and cool nights, and cool winter days with cold nights. The Project area receives approximately 14 to 16 inches of precipitation on an average annual basis, mostly in the form of snowfall.

The Project area contains two sub-basins of the Willow Creek watershed, the Indian Spring sub-basin, which parallels Hayden Hill Road east of the Project area, and the Preston Canyon sub-basin, located west and north of Hayden Hill. Surface waters in both sub-basins generally flow to the north into Willow Creek. Southwest of the mine site, the Silva Flat sub-basin, which is a broad relatively flat area, containing several small lakes and reservoirs, is drained through Juniper Creek.

The Project area falls generally into the Upper Montane - lower Northern Coniferous Forest ecological zone. This zone is typified by shallow, rocky soils, and vegetation communities which include Low Sagebrush, Upland Shrub, and Jeffrey Pine/Mountain Shrub. Wildlife typical of this region include sage grouse and various other resident and migratory birds, reptiles, and mammals including mule deer and pronghorn antelope. The Modoc sucker, Bald eagle and peregrine falcon, a Federally listed endangered species, may be present on or near the Project site. One pair of Sandhill cranes have been observed near Silva Flat reservoir.

Land use in the Hayden Hill area consists of grazing, watershed, timber production, wildlife habitat, recreation, and minerals exploration. Two grazing allotments lie within the detailed Project study area. Commercial timber lands occur along the proposed pit, waste rock dump, and access and utility corridors. A California State Wildlife Refuge includes the southwestern corner of the Project area. Recreational users of the area include hunters requiring access to regions west of Hayden Hill and a few tourists. Historic mining and recent precious metals exploration have occurred within the Project area.

The Project will require 210 full time employees. It is estimated that 110 jobs will be filled locally. The remaining jobs will be filled by workers immigrating to the Susanville, Alturas, Adin and Bieber areas. The main access to the site will be Hayden Hill Road, a county administered road which intersects Highway 139 approximately 50 miles north of Susanville.

V Summary of Environmental Consequences

Anticipated environmental effects of the Proposed Action and alternatives are evaluated in Chapter 4.0 according to criteria for significance established at the beginning of Chapter 4.0. Measures to reduce these effects are proposed for each resource area. These potential impacts and mitigation measures are summarized for each environmental resource area in Table I, Summary of Potential Effects and Mitigation Measures. The mitigation measures are those proposed by the Applicant, SRK, subcontractors, and the Responsible Agencies. The third column of Table I, Significance After Mitigation, is a summary of the significance of the impacts after mitigation, including unavoidable adverse impacts, identified for each resource area.

VI Cumulative Impacts

Cumulative impacts, for the purposes of this EIR/EIS, are those impacts which would result from the identified impacts of the Proposed Action in conjunction with impacts resulting from other past, present and reasonably foreseeable projects and activities in the area. The activities and projects which have been determined to have the potential for cumulative impacts with the Project are listed below. There are no other precious metal mining projects, presently operating or proposed, in the vicinity of the Project.

- Timber Harvesting
- Grazing
- Timber and Wood Products Industries
- California Correctional Center Expansion
- Sierra Army Depot
- Lassen College Cogeneration Project

All of the resource areas were evaluated for cumulative impacts. Cumulative impacts are discussed in detail for the resource areas in which cumulative impacts were identified as indicated below:

- Soils (Timber Harvesting, Section 4.2.3.5)
- Vegetation (Timber Harvesting, Section 4.2.4.5)
- Wildlife (Grazing; Timber Harvesting, Section 4.2.5.7)
- Water Resources (Timber Harvesting, Section 4.2.6.5)
- Socioeconomics (Timber and Wood Products Industries; California Correctional Center Expansion; Sierra Army Depot, Section 4.2.8.12)
- Land Use (Timber Harvesting, Section 4.2.9.8)
- Transportation (Lassen College Cogeneration Project; California Correction Center Expansion, Section 4.2.12.5)

Cumulative impacts have been identified for watershed and the prison expansion. The Sierra Army Depot, if expansion occurs, could add to potential cumulative effects. These impacts are discussed in detail in the sections cited above and summarized below. Cumulative impacts of grazing combined with the Proposed Action would affect the sage grouse population. This is discussed in Section 4.2.5.7.

No other areas of lost timber harvesting lands were identified. Further discussion on this topic is included in section 4.2.9.5. No cumulative transportation impacts were identified for the Lassen College Cogeneration Project or any other project in the area. A discussion on this topic is found in Section 4.2.12.5.

Computer modeling of the potential sediment yield impacts of the Project in conjunction with proposed timber sales in the area was completed to determine if cumulative watershed impacts would be significant (FES 1991). The results indicate the cumulative effects for these two activities will not cause significant increases in sediment related watershed impacts to streams and aquatic life downstream of the Project.

Cumulative socioeconomic impacts would result if the California Correctional Center expansion coincides with the Project as indicated by current schedules. The cumulative effect could be an increased population in various locations within commuting distance to the Project. The increased population would produce a corresponding increase on the demand for schools, local government facilities and services. The severity of this impact would be determined by the number of Project employees who decide to locate in particular areas having limited services and/or funding to support a substantial increase in population. This includes the Big Valley and Modoc County areas. A substantial amount of new residential development in Modoc County and the net cumulative impact could increase the potential for fiscal deficits to Modoc County and increase the potential for excess housing stock after Project closure.

Mitigation of developing transportation or housing policies which encourage workers to locate in Susanville would reduce, but not eliminate, this impact.

Due to cutbacks in the local timber industry, the corresponding increase in the local labor pool and housing availability, the Project is not expected to produce a significant demand for new housing or consequently, a significant increase in the demand for related services.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
PROPOSED ACTION		
Geology and Topography	Geology and Topography	Geology and Topography
Changes in landforms due to the waste rock dump, heap leach and tailings impoundments.	During operations, slopes will be shaped during material placement or removal. During reclamation, sharp edges will be rounded and straight lines will be altered.	Not significant. These topographic effects conform to the regional topography.
Hayden Hill will be modified by the development of the mine. The pit will create an unnatural landform in the region.	No mitigation possible.	Significant.
Buildings and structures, growth media stockpiles, and roads will modify 215 acres.	Buildings and structures will be removed during closure. Roads will be graded to create undulating landforms. Growth media will be re-spread for reclamation.	Not significant.
Potential ground motion from earthquakes could pose a hazard to Project facilities. Indirect effects include liquefaction and landslide activity.	Seismic risk analyses were conducted for the Project site. Structures and facilities are designed to meet current applicable seismic safety standards. The stability of the tailings embankment was evaluated and designed considering liquefaction. Facilities that hold or impound hazardous potentially hazardous materials are located in areas that would not be impacted by landslide activity.	Not significant.
Erosion, slope failure, and slumping of pit highwalls, the waste rock dump and other facilities could cause public hazards.	Stability analyses were conducted for all Project components. During reclamation, stable surface, topographic, and drainage conditions will be established. Structures or landforms that could pose a hazard will be stabilized, removed, and/or fenced.	Not significant.
Soil	Soil	Soil
Increased wind and water erosion on 805 acres following excavation of soil and 145 acres following disturbance of vegetation.	A sediment and erosion control plan is included in the Reclamation Plan.	Not significant.
Remote possibility of insufficient stockpiled growth media to place 12-inches over all excavated areas.	Suitable "B" horizon and lower soil materials will be used to bring areas to within 12 inches of grade. Soil which does not meet salvage criteria will also be salvaged for use.	Not significant.
The stored growth media may lose some productivity due to depth of burial and loss of vegetative input.	Slopes will be <3H:1V, and interim revegetation will include legumes. Stockpiles left in place over 3 years will be monitored for fertilizer requirements and microbial activity. Amendments will be added as necessary. Compaction will be minimized.	Not significant.
Low Sagebrush vegetation may be difficult to reestablish on soils after the duripan soil structure is removed.	Field trials shall include studies on how to best reclaim the Low Sagebrush habitat. The habitat value of an equal amount of similar habitat will be protected adjacent to the Project.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
PROPOSED ACTION		
Jeffrey Pine/Mountain Shrub vegetation may not re-establish to a point capable of supporting commercial timber stands due to soil removal.	No mitigation possible.	Not significant. The acreages involved are small compared to that available.
Vegetation	Vegetation	Vegetation
296 acres of Jeffrey Pine/Mountain Shrub vegetation and associated habitat will be removed.	150 Jeffrey pine seedlings per acre will be planted in areas of Jeffrey Pine/Mountain Shrub vegetation disturbance as shown in the Reclamation Plan. 230 acres of this vegetation type will be protected adjacent to the site.	Not significant.
105 acres of commercial timber land will be removed from production.	No further mitigation possible.	Not significant.
102 acres of the Jeffrey Pine/Mountain Shrub disturbance in the pit area will be left for natural revegetation.	All areas of the pit and waste rock dump will be seeded with an appropriate seed mix.	Not significant.
244 acres of Upland Shrub vegetation and associated habitat will be disturbed by removal.	None proposed.	Not significant.
34 acres of Upland Shrub disturbance in the pit area will not be reclaimed.	All areas of the pit and waste rock dump will be seeded with an appropriate seed mix.	Not significant.
355 acres of Low Sagebrush vegetation and associated habitat will be disturbed by removal.	355 acres of this vegetation type will be protected and enhanced adjacent to the site.	Significant.
13 acres of planted pasture grassland vegetation and associated habitat will be disturbed by removal.	35-40 acres of meadow vegetation will be protected and maintained adjacent to the site.	Not significant.
35 acres of native grassland vegetation and associated habitat will be disturbed by removal.	35-40 acres of meadow vegetation will be protected and maintained adjacent to the site.	Not significant.
6.55 acres of wetlands, 80 lineal feet of permanent stream and 1,315 lineal feet of intermittent stream will be disturbed by removal or burial.	18.5 acres of seasonally inundated wetlands will be created adjacent to the site. 404 permit stipulations will be enforced.	Not significant.
Water and wind erosion could occur in the areas of disturbed and excavated vegetation causing impacts to surrounding vegetation, water and air quality.	The Reclamation Plan includes interim and concurrent revegetation as well as a sediment control plan which will minimize this impact.	Not significant.
20 percent of the presently known population of Antennaria Flagellaris in California will be disturbed by removal.	None proposed.	Not significant.
Site disturbance may allow the invasion of weed species.	The Reclamation Plan includes measures to control invasion and a plan to follow if invasion occurs.	Not significant.
Two acres of Manzanita shrub, Wyethia/grass vegetation on Snag Hill will be disturbed by removal.	Most areas of disturbance at Snag Hill will be reclaimed. The access road, parking area and helispot will remain unreclaimed.	Not significant.
Reclamation may fail.	A success evaluation is included in the Reclamation Plan.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
PROPOSED ACTION		
Wildlife and Aquatic Biology	Wildlife and Aquatic Biology	Wildlife and Aquatic Biology
Vegetation removal would cause a loss of habitat for wildlife.	Habitat quality of adjacent areas will be enhanced by planting preferred forage, prescription burning to create brushy conditions, protection of 230 acres of Jeffrey Pine, livestock grazing management, and creation of an 18.5 acre wetland.	Not significant.
Two leks, 355 acres of low sagebrush and 35 acres of meadow habitat for sage grouse, a species of concern in California, may be lost.	Passive luring of young grouse away from mine operations to new lek sites for two more seasons. 355 acres of low sagebrush vegetation will be enhanced nearby and 35 acres of meadow habitat will be protected and enhanced at the Anderson Ranch. Brood-rearing habitat will be enhanced by creation of an 18 acre wetland.	Not significant.
Potential nesting sites for raptors would be eliminated.	Pit walls will be modified to provide nesting habitat post mining.	Not significant. Cliff and talus habitat created by modification of the pit walls will increase.
Ponds containing cyanide in excess of 10 ppm could cause loss of wildlife.	All ponds will be fenced. Ponds containing cyanide solution above 10 ppm will be completely covered with 1-inch netting. If netting fails, access will be prevented by mine personnel utilizing noise-makers on a 24 hour basis. Tailings will be neutralized to non-lethal levels.	Not significant.
Potential disruption of pronghorn and mule deer movement/migration patterns.	Perimeter fence will allow passage.	Not significant.
Increased traffic to and from the mine site may increase road kill rates.	Van pool service for mine employees will be used to reduce traffic. Road kill will be promptly removed. Speed limit 25 mph .	Not significant.
Habitat decrease and wildlife disturbance could be caused by additional poaching, woodcutting, and recreation resulting from the increased access to the area.	None proposed.	Not significant.
Project related noise, such as blasting, could have an adverse effect on wildlife.	None proposed.	Not significant. Studies indicate noise disturbance minimally affects wildlife.
The introduction of sediments into the streams from erosion of disturbed areas during construction and operations would reduce aquatic habitat.	Erosion control measures will be ongoing throughout construction and mine life. Detention ponds will be constructed to intercept waterborne sediments originated from run-off and dust settlement.	Not significant.
Stream crossing construction will permanently cover 60 feet of riffle/run habitat.	Selected design that caused least change to stream bottom. 500 feet of stream bank upstream protected from grazing. Construction will be conducted during low-flow periods.	Not significant
Water Resources	Water Resources	Water Resources
Minor springs and seeps near the pit which are fed from the local perched groundwater system will be altered.	Re-route seeps where feasible, away from facilities.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
PROPOSED ACTION		
Project water supply wells may affect regional water table due to pumping drawdown.	Groundwater consumption will be recorded. Groundwater levels will be monitored on a quarterly basis. If drawdown exceeds estimates, well field modeling will be re-evaluated. Heap leach operations will use evaporation minimizing methods to reduce water consumption.	Not significant.
Natural drainages would be altered by construction of the heap leach facility.	Drainages altered by heap leach pad will be diverted around the facility.	Not significant.
Surface and groundwater quality could be degraded by Acid Rock Drainage, heavy metals, low pH, spillage or leakage of cyanide, reagents or fuels used on-site.	Process solution ponds and the heap leach pads will be lined pursuant to CRWQCB regulations. Liners will contain leak detection systems. Solutions will be transported by pipes in lined ditches. Monitoring of surface and groundwater throughout the site. Detoxification of waste to meet CRWQCB requirements. Isolation and encapsulation of ARD producing waste rock identified during monitoring. Compliance with the Geochemical Sampling and Contingency Plan to address ARD, heavy metals and pH monitoring. Including type and frequency of sampling.	Not significant.
Precipitation could partially fill the empty pit. Standing water could degrade, affecting surface and groundwater.	A pit dewatering system will be designed and installed if ponding occurs. Use pit water for dust suppression and mill water make up requirements. Ponded pit water will be treated prior to discharge, if of poor quality.	Not significant.
Erosion of disturbed areas will increase sediment load in drainages.	Reclamation and erosion control measures will be on-going during the Project and after closure. Sediment control devices will be checked periodically for blockage. Permanent sedimentation detention facilities will be built downgradient of the waste rock dump and facilities area.	Not significant.
Groundwater used for water supply will not be available for other use during life of the Project.	No mitigation available.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
	PROPOSED ACTION	
Air Quality	Air Quality	Air Quality
Fugitive dust from mining and hauling.	The permanent haul roads will be controlled with a chemical dust control agent and water, temporary haul roads and secondary on-site roads will be controlled with a chemical dust control agent or water. Dry drilling will be controlled with cyclones, water spray or bag-filter collection on the drill rigs.	Not significant.
Fugitive dust from travel on access road.	The access road will be controlled with water or chemical dust control agent when necessary.	Not significant.
Fugitive dust from wind erosion of exposed surfaces.	Exposed surfaces such as topsoil stockpiles, completed waste rock lifts and haul roads not in use will be revegetated during the next available growing season.	Not significant.
Fugitive dust from ore crushing.	The crushing system will be controlled with sonic foggers at 95 percent control efficiency, and the conveyor discharge points with water sprays.	Not significant.
Process particulates from ore refining.	The doré furnace dust emissions will be hooded and ducted to a baghouse which will provide a 99.5 percent control of the condensible fume particulates.	Not significant.
Fugitive dust from lime silo loading.	The silo vent will be ducted to a baghouse for 99 percent control of lime dust.	Not significant.
Mercury emissions from ore refining.	The matte from the filter press, containing gold, will be retorted for possible mercury. This will remove virtually all mercury that may have been collected with the gold.	Not significant.
Hydrogen cyanide from the leaching processes.	The leach solution will be kept at a pH greater than 10.5 to minimize the formation of hydrogen cyanide.	Not significant.
Engine exhaust gases.	All stationary sources will be fueled by propane. Diesel engines will contain pollution control devices installed by the manufacturers. Diesel fuel containing no more than 0.25% sulfur will be used. Engines will be kept in tune through a regular maintenance program.	Not significant.
The Project will exceed Lassen County Air Pollution Control District's standards for offsets.	All known possible sites for offsets were investigated, the only offsets available would result in little air quality benefit.	Not significant. It is not a violation if offsets result in little benefit or if offsets are not available. The exemption of the offset requirement is possible.
Socioeconomics	Socioeconomics	Socioeconomics
It is estimated that of the 210 people hired for the Project operations, 100 will be non-local. Population increase, estimated to be 365 people, will place demands on housing availability.	Rental housing may be difficult to find, but adequate housing would be available to meet demand.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
PROPOSED ACTION		
Educational programs at the area schools would have to be cut to accommodate the additional estimated 81 students.	Negotiated compensation between local school districts and Applicant.	Significant. Dependent upon negotiated compensation with LGMI.
Additional demands for local government facilities and services could result in reduction of quantity and quality of service.	Already existing self-funding mechanisms such as sales tax, property taxes, consumption fees, etc. should go into effect for some infrastructure deficiencies.	Unknown.
Development and growth which may be induced along the power line corridor will exacerbate demand for local government and services.	Adoption of the Power Supply Alternative.	Not significant.
Land Use	Land Use	Land Use
Proposed Action conflicts with some provisions of existing regulatory land use objectives.	Incorporate best management practices during mine development to achieve resource utilization and maintain multiple land use objectives for USFS, BLM, and private lands.	Not significant.
Proposed Action will exclude the use of lands near the mine for grazing during the Project.	Increase carrying capacity of existing grazing allotments or identify alternate grazing areas with equivalent capacity.	Not significant.
Proposed Action will preclude access to 530 acres of State Game refuge land during the life of the mine.	None proposed.	Not significant.
Agricultural Preserve lands within the site boundary will be affected by the Project.	These lands are non-prime agricultural lands. The lands to be affected will be withdrawn from Williamson Act contract. The Reclamation Plan will provide for restoration of rangeland resources after mining.	Not significant.
USFS and BLM commercial timber lands within the site boundary would be removed from production.	Identify, inventory and schedule removal of timber prior to mine development. Design and locate roadways to minimize impacts to future timber sales. Properly dispose of biomass material (non-merchantable logs, tree tops, limbs, and small trees).	Not significant.
Long-term growth induced by proposed transmission line installation.	Adoption of the Power Supply Alternative.	Not significant.
Cultural Resources	Cultural Resources	Cultural Resources
The Hayden Hill townsite and fire tower, historic sites eligible to the NRHP, will be disturbed or destroyed by Project activities and construction.	To study the residential core of the townsite, 400 one-meter square units will be excavated. Additional surface locations will be documented. This mitigation has been approved by the State Historic Preservation Officer (SHPO) for review. The fire tower will undergo Historic American Building Survey recordation.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES (CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
PROPOSED ACTION		
The Proposed Action may impact two eligible historic sites and other non-eligible prehistoric and historic sites on the Project site and within the corridor routes. Power line construction may impact two prehistoric sites with undetermined eligibility.	All sites were adequately documented at the time of the survey. If sites with undetermined eligibility cannot be avoided, eligibility to the NRHP will be determined. If eligible, mitigation measures approved by the BLM and SHPO will be incorporated.	Not significant.
Graves may be encountered outside the cemetery. Previously undiscovered cultural sites may be encountered.	All activity affecting the site will cease until evaluated by the proper authorities.	Not significant.
Unauthorized collection of artifacts may occur.	All employees, consultants, contractors, and authorized visitors will be informed as to the seriousness of disturbance to the sites.	Not significant.
Vandalism or degradation may occur in the cemetery.	The cemetery is fenced and will remain so during mine life.	Not significant.
Visual Resources	Visual Resources	Visual Resources
The Proposed Action would modify topography and the visual appearance of the site. The waste rock dump and upper portions of the pit areas could be viewed from Highway 139, and as far away as Adin to the north.	Vegetation will be maintained around the pit and waste rock dump during Project operations. Species to be planted on the waste rock dump will be determined by field trials. To promote topographic diversity on the waste rock dump, subsoil will be left in a rough condition and the running of the benches will be performed in a random manner. The slopes between benches will be hydroseeded.	Not significant. Successful reclamation efforts will result in landforms and vegetation types and patterns that are harmonious with the surrounding landscape. The Visual Quality Objectives (VQOs) for the area will be met.
Improvements to the intersection of the Hayden Hill Road with Highway 139 will be viewed from Highway 139.	The improvements will be designed to blend with the landscape.	Not significant. VQOs will be met.
All Project activities and facilities would be viewed from secondary roads and low hills in the area.	Colors and material of all structures will be selected to be harmonious with the natural surroundings. VQOs for the area will be met if planned reclamation is successful. To ensure success, the monitoring program described in the vegetation section will be used.	Not significant. VQOs for the area will be met.
The reclaimed pit highwalls would remain apparent in the landscape since rock walls are not typical of the area.	During reclamation, the uniformity of benches and highwalls of the uppermost pit walls will be shaped and contoured to achieve a more natural appearance.	Not significant. The reshaped pit would closely approximate natural rock outcroppings. Existing disturbance to the site does not meet VQOs for this area.
Views from Highway 139, a scenic highway, will be impacted by the installation of the power line.	The power line will be planned to blend with the landscape. Vegetative clearing will be minimal, and steep slopes avoided when possible. Colors and material will be chosen to blend with the landscape. Poles will be hidden in the trees at the crossing of Highway 139 near the Hayden Hill Road intersection.	Not significant. The VQOs for the area will be met.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
	PROPOSED ACTION	
Transportation	Transportation	Transportation
Heavy truck traffic in the area of influence would deteriorate existing roads (County Road A2)	Highway life would not be reduced if vehicles transporting equipment and materials do not exceed legal weight limits.	Not significant.
Heavy trucks may use Lassen County Road A2 which is not designed for heavy truck traffic.	Develop a transportation policy to discourage vendors and employees from using this road.	Not significant.
Hazards due to transporting cyanide, reagents, and blasting agents in the area of influence.	Preparation and implementation of an emergency response plan, hazardous materials spill training and increasing the number of emergency response personnel. LGMI could supply training and equipment. Preparation by the Applicant of a Spill Prevention and Countermeasure Plan and an Emergency Response Plan.	Not significant.
Recreation	Recreation	Recreation
Non-local construction workers may camp at the Willow Creek Campground near the Project site during pre-production activities. This would reduce the number of resources to others, and overuse may result in damage to wildlife habitat, vegetation, and water resources.	A 14-day stay limit is enforced by the USFS. Strict enforcement of camp restrictions to discourage worker camping. The Applicant will add a condition to construction contracts instructing them not to use Willow Creek campground.	Not significant.
Public access would be denied to the Hayden Hill cemetery which lies within the Project boundary.	A system of escorted access will be provided and supervised by the Applicant.	Not significant.
Loss of historical value of Hayden Hill mining district in its present condition.	Develop an observation turnout near the mine with signs and exhibits describing the historic and current mining activities.	Not significant.
Recreation resources such as the Hayden Hill townsite and fire tower would be eradicated.	None proposed. A new fire lookout will be built on Snag Hill.	Not significant.
Elimination of rock hounding, hunting and bird watching on and near the Project site.	None proposed.	Not significant.
Noise	Noise	Noise
Noise levels in the immediate vicinity of the pit will increase.	Heavy equipment will be fitted with mufflers and engine enclosures. Blasting will be conducted in accordance with regulations and to prevent damage to buildings and structures. Air blast and vibration will be controlled.	Significant. Project noise will be perceptible in this very quiet area.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
NO ACTION ALTERNATIVE		
Geology and Topography	Geology and Topography	Geography and Topography
Hayden Hill would not be modified by the open pit and an unnatural landform would not be introduced to the region. Interest in the ore would continue.	None.	Not significant.
Soils	Soils	Soils
Present elevated erosion and sediment rates would continue due to disturbance at the site. No additional impacts to soils would occur.	None.	Not significant.
Vegetation	Vegetation	Vegetation
Existing disturbances to all vegetation types from past mining and exploration which pre-date reclamation requirements will remain.	None.	Not significant.
Wildlife and Aquatic Biology	Wildlife and Aquatic Biology	Wildlife and Aquatic Biology
No additional impacts to wildlife or aquatic habitats would occur.	None.	Not significant.
Water Resources	Water Resources	Water Resources
No increased potential for surface and groundwater contamination by acid rock drainage, heavy metals, and increased sedimentation.	None.	Not significant.
Air Quality	Air Quality	Air Quality
The concentrations of all regulated pollutants would remain within ambient standards.	None.	Not significant.
Socioeconomics	Socioeconomics	Socioeconomics
Would eliminate, for the time being, impacts due to additional employment, income, and local government revenues and demands on local government facilities, services and per capita operating expenses.	None.	Not significant.
No related employment and revenue for local governments would be generated.	None.	Significant.
Land Use	Land Use	Land Use
Grazing allotments would not be affected. State wildlife refuge would not be reduced in size. Timber land would not be taken out of production.	None.	Not significant.
Cultural Resources	Cultural Resources	Cultural Resources
The current level of alteration or destruction of cultural sites would not be altered.	None.	Not significant.
Visual Resources	Visual Resources	Visual Resources
Visual impacts caused by changes to the site topography would not occur. Visual impacts caused by preexisting disturbance to the site would remain.	None.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
Transportation	Transportation	Transportation
Would not increase traffic volumes and deteriorate select dirt roads in the area of influence.	None.	Not significant.
Recreation	Recreation	Recreation
Existing recreational uses at the mine site would not be affected.	None.	Not significant.
Noise	Noise	Noise
Increased noise in the vicinity of the mine site would not occur.	None.	Not significant.
COMPREHENSIVE BACKFILLED PIT ALTERNATIVE		
Geology	Geology	Geology
Evidence of mineralization in the pit would be covered, making future exploration difficult.	None available.	Significant.
Soils	Soils	Soils
The topsoil under the temporary waste rock dump may be lost or adversely affected by leachate	Topsoil can be salvaged and stockpiled before placement of waste rock in the temporary dump.	Not significant.
Water and wind erosion would be increased due to the time of exposure.	Interim revegetation will be performed on the waste rock dump.	Not significant.
	Sediment control procedures will be developed for this alternative.	
Vegetation	Vegetation	Vegetation
122 acres of the 176 acre pit are reclaimed under the Proposed Action. 150 acres are reclaimed under this alternative.	None required.	Beneficial.
Longer time period before reclamation increasing potentials for erosion and sedimentation.	Concurrent interim reclamation.	Not significant.
Wildlife and Aquatic Biology	Wildlife and Aquatic Biology	Wildlife and Aquatic Biology
Would preclude post-mining use of pit highwalls for raptor nesting.	None.	Not significant.
Would delay reclamation of some habitats by eight to ten years since concurrent reclamation of the waste rock dump would not be possible.	Interim reclamation would be implemented.	Not significant.
Possible degradation of groundwater in pit area due to waste rock replacement. Groundwater contamination could affect aquatic resources.	See Water Resources, below.	Not significant.
Water Resources	Water Resources	Water Resources
Percolation of surface waters into the pit, which could pond and infiltrate, transporting contaminants into the water table.	Same as Proposed Action.	Not significant.
	Installation of an impermeable soil cap over the top of the backfilled pit to stop infiltration.	
	Monitoring of ponded water in pit for both quantity and quality.	

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
Additional water consumption for dust control.	None available.	Not significant.
Air Quality Emissions of PM10, NO_2 and CO would continue to impact air quality for an additional four years.	**Air Quality** Same as the Proposed Action.	**Air Quality** Not significant. Impacts will be within legal limits.
Socioeconomics Impacts due to the Proposed Action would be extended an additional four years.	**Socioeconomics** Same as for the Proposed Action, but accounting for an additional four years.	**Socioeconomics** Significant. Depends on negotiated compensation with LGMI.
Visual Resources The pit highwalls would remain apparent in the landscape since rock walls are not typical of the area. Visual impacts caused by the waste rock dump would be eliminated.	**Visual Resources** Waste material will be used to shape the final pit areas to create landforms and slopes found in the existing landscape. Topsoil will be spread over the waste material for revegetation.	**Visual Resources** Beneficial.
Transportation Impacts due to the Proposed Action would be extended an additional four years.	**Transportation** Same as for the Proposed Action, but extending for four more years.	**Transportation** Not significant.
Noise Impacts due to the Proposed Action would be extended an additional four years.	**Noise** Same as for the Proposed Action, but for an additional four years.	**Noise** Not significant.
PARTIALLY BACKFILLED PIT ALTERNATIVE		
Geology Evidence of mineralization in the Providence Zone would be covered, making future exploration difficult.	**Geology** None available.	**Geology** Significant.
Vegetation Slightly more reclaimable area in the bottom of the Providence zone of the pit.	**Vegetation** None required.	**Vegetation** Beneficial.
Water Resources Percolation of surface waters into the pit, which could pond and infiltrate, transporting contaminants into the water table.	**Water Resources** Same as Proposed Action. An additional impermeable cap, installed across the top of the backfilled pit would be required to minimize infiltration of precipitation run-off. Monitoring of ponded water in pit for both quantity and quality.	**Water Resources** Not significant.
Air Quality Haul distances will be shorter, slightly decreasing emissions.	**Air Quality** Same as the Proposed Action.	**Air Quality** Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
Visual Resources	Visual Resources	Visual Resources
The pit highwalls would remain apparent in the landscape since rock walls are not typical of the area. Visual impacts from the waste rock pump would be slightly reduced.	Waste material will be used to shape the Providence zone of the pit to create slopes and landforms similar to the area. Topsoil will be spread over the waste material for revegetation.	Not significant.
COMPLETE BENCHING ALTERNATIVE		
Soil	Soil	Soil
Water erosion would be reduced due to lowered length of slope below 5,750-foot contour.	None required.	Beneficial.
Vegetation	Vegetation	Vegetation
10 more acres reclaimed than Proposed Action.	None required.	Beneficial.
Lower erosion potential than Proposed Action.	None required.	Beneficial.
20 acres more disturbance of primarily Jeffrey Pine/Mountain Shrub vegetation than Proposed Action.	150 Jeffrey pine seedlings per acre will be planted in the area of disturbance. Implementation of the HMMP, Appendix I.	Not significant.
Wildlife and Aquatic Biology	Wildlife and Aquatic Biology	Wildlife and Aquatic Biology
20 acres more disturbance of primarily Jeffrey Pine/Mountain Shrub habitat than Proposed Action.	150 Jeffrey pine seedlings per acre will be planted in the area of disturbance. The HMMP, Appendix I, would be implemented.	Not significant.
Lower erosion potential than Proposed Action.	None.	Beneficial.
Water Resources	Water Resources	Water Resources
Complete benching would reduce potential sediment loading from the waste rock dump.	None required.	Beneficial.
Air Quality	Air Quality	Air Quality
Lower erosion potential may slightly decrease PM10 impacts from wind erosion.	Same as the Proposed Action.	Not significant.
SMOOTHED WASTE ROCK DUMP ALTERNATIVE		
Soil	Soil	Soil
Increased water and wind erosion due to increased length of slope and time of exposure.	The entire waste rock dump will be covered with 12-inches of growth media and revegetated. Interim reclamation will be performed. The proposed sediment control facilities will be re-evaluated for sufficiency.	Not significant.
Vegetation	Vegetation	Vegetation
52 acres more disturbance of primarily Jeffrey Pine/Mountain Shrub vegetation.	150 Jeffrey pine seedlings per acre will be planted in area of disturbance.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
Concurrent reclamation not possible.	Interim reclamation will be completed.	Not significant.
Increased erosion and sediment potential.	Interim reclamation will be completed. Smoothing will be done disturbing as little area as possible.	Not significant.
Total overall unreclaimed disturbance reduced from 137 acres to 54 acres.	None required.	Beneficial.
Wildlife and Aquatic Biology	Wildlife and Aquatic Biology	Wildlife and Aquatic Biology
52 acres more disturbance of primarily Jeffrey Pine/Mountain Shrub habitat.	150 Jeffrey Pine seedlings per acre of disturbance would be planted.	Significant.
	Jeffrey pine seedlings will be planted as part of reclamation.	
Increased erosion and sediment potential.	Interim reclamation will be completed. Smoothing will be done disturbing as little area as possible.	Not significant.
Water Resources	Water Resources	Water Resources
Higher run-off flow rates would increase erosion thereby increasing sediment loading in downgradient drainages.	Design and installation of sediment fences and detention ponds along surface drainages.	Not significant.
Additional water use for dust control.	None available.	Not significant.
Air Quality	Air Quality	Air Quality
PM10 emissions would result from earthmoving activities, and will exist for the increased Project life.	The fall and slide distances of material being moved will be minimized.	Not significant. PM10 emissions will be within legal limits.
Socioeconomics	Socioeconomics	Socioeconomics
All impacts due to the Proposed Action would occur for one to two more years.	Same as the Proposed Action, but accounting for one to two more operating years.	Significant. Depends on negotiated compensation with LGMI.
Visual Resources	Visual Resources	Visual Resources
Reclamation of the waste rock dump during mine life would not take place, causing adverse visual impacts.	Interim reclamation will take place.	Not significant.
Transportation	Transportation	Transportation
All impacts due to the Proposed Action would continue for one to two more years.	Same as the Proposed Action, but accounting for one to two more operating years.	Not significant.
Noise	Noise	Noise
All impacts due to the Proposed Action would continue for one to two more years.	Same as the Proposed Action, but accounting for one to two more operating years.	Not significant.
FACILITIES LOCATION ALTERNATIVE 3		
Soil	Soil	Soil
1770 cubic yards more topsoil available for salvage.	None required.	Beneficial.
11.5 additional acres of soil and Low Sagebrush habitat disturbed by excavation.	Reclamation will be performed on this area inclusive of the field trials done for the Proposed Action. Implementation of the HMMP, Appendix I.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES (CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
Vegetation	Vegetation	Vegetation
11.5 additional acres of Low Sagebrush and associated habitat impacted.	Reclamation will be performed on this area inclusive of field trials. The HMMP would be implemented.	Not significant.
Impact to wetlands reduced to 2.5 acres.	None required.	Beneficial.
Wildlife and Aquatic Biology	Wildlife and Aquatic Biology	Wildlife and Aquatic Biology
11.5 additional acres of Low Sagebrush habitat disturbed by excavation.	Mitigation for impacts to Low Sagebrush and sage grouse leks will remain the same as the Proposed Action.	Not significant.
POWER SUPPLY ALTERNATIVE		
Wildlife	Wildlife	Wildlife
Construction and use impacts.	Same as Proposed Action.	Not significant.
Induced growth impacts would be lessened proportional to the amount of growth expected.	None required.	Beneficial.
Air Quality	Air Quality	Air Quality
Limited growth would minimize impacts from residential wood burning.	None required.	Beneficial.
Socioeconomics	Socioeconomics	Socioeconomics
Growth-induced impacts would be lessened if the Applicant owns the transmission line.	None required.	Beneficial.
Land Use	Land Use	Land Use
Development and growth-induced impacts would be lessened.	None required.	Beneficial.
Visual Resources	Visual Resources	Visual Resources
Removal of the power line would improve the long-term visual quality of the corridor.	None.	Beneficial.
FIRE TOWER ALTERNATIVE		
Vegetation	Vegetation	Vegetation
New location would likely disturb some vegetation.	None required.	Not significant.
Wildlife and Aquatic Biology	Wildlife and Aquatic Biology	Wildlife and Aquatic Biology
New location would not cause habitat disturbance and removal because the site is already developed.	None required.	Not significant.
Air Quality	Air Quality	Air Quality
Relocation may cause minor air impacts during movement operations.	None required.	Not significant.
Socioeconomics	Socioeconomics	Socioeconomics
Relocation may result in minor re-distribution of tourists.	New location may replace the old location as a tourist and educational attraction.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
Land Use	Land Use	Land Use
Relocation would not result in any impacts to land use.	None required.	Not significant.
Cultural Resources	Cultural Resources	Cultural Resources
Impacts at the developed relocation site are unlikely.	None required.	Not significant.
Visual Resources	Visual Resources	Visual Resources
A site has been chosen for relocation in a developed area. The fire tower should not cause impacts to visual resources in this developed area.	None required.	Not significant.
Recreation	Recreation	Recreation
Area where fire tower is replaced would have an additional recreational resource.	None required.	Not significant.
FLOATING COVER ALTERNATIVE		
Wildlife and Aquatic Biology	Wildlife and Aquatic Biology	Wildlife and Aquatic Biology
Increased potential for impacts to wildlife such as waterfowl.	No further mitigation possible.	Significant.
Unknown potential for cover failure.	Ponding cyanide solutions would be siphoned or pumped off of the cover in the event of failure.	Not significant.
Air Quality	Air Quality	Air Quality
Potential impacts due to hydrogen cyanide emissions from solution ponds.	None required.	Not significant.
PROCESS SOLUTION TANKS ALTERNATIVE		
Tank System Design	Tank System Design	Tank System Design
Tank systems represent new technology for the mining industry.	None proposed.	Significant.
Additional energy demand to pump solutions.	None available.	Not significant.
Possibility of frozen pipes causing a release of solutions.	All piping within event pond or ditches which drain to the event pond.	Not significant.
Possibility of failure of floating covered event pond.	Cover event pond with netting instead of a floating cover.	Significant.
Health and Safety	Health and Safety	Health and Safety
Additional training and safety equipment required for repair work in tanks.	Follow regulatory controls.	Not significant.
Project Economics	Project Economics	Project Economics
Additional $2,750,000 in Project cost prior to beginning operations.	None available.	Significant.
Soils	Soils	Soils
Additional 2.5 acres of duripan soils will be removed.	None required.	Not significant.

TABLE I
SUMMARY OF POTENTIAL EFFECTS AND MITIGATION MEASURES
(CONTINUED)

POTENTIAL EFFECTS	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
Vegetation	Vegetation	Vegetation
2.5 additional acres of Low Sagebrush vegetation and associated habitat impacted over Proposed Action.	Implementation of the HMMP.	Not significant.
Wildlife and Aquatic Biology	Wildlife and Aquatic Biology	Wildlife and Aquatic Biology
Similar impacts to wildlife as the Proposed Action.	Same as Proposed Action. Require netting covered ponds.	Not significant.
Additional 2.5 acres of Low Sagebrush habitat will be lost.		
Increased potential for failure of floating cover on storm event pond.	Implementation of the HMMP.	Not significant.
	Ponding cyanide solutions would be siphoned or pumped off of the cover prior to maintenance. Requirement for netting covered ponds.	Not significant.
Air Quality	Air Quality	Air Quality
Potential impacts due to hydrogen cyanide emissions from solution ponds.	None required.	Not significant.
Visual Resources	Visual Resources	Visual Resources
The size and material of these structures would contrast with the surrounding area and impact views from secondary roads south and west of the Project site.	Structures will be painted with colors that blend with the existing environment.	Not significant.

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CHAPTER 1.0
INTRODUCTION

1.0 INTRODUCTION

This Final Environmental Impact Report/Environmental Impact Statement (Final EIR/EIS) describes a precious metals mining and ore processing operation proposed by Lassen Gold Mining, Inc. (LGMI). Referred to herein as the Hayden Hill Project (Project), the Proposed Action would include an open pit mine, a waste rock disposal area, heap leach and mill processing facilities, a gold and silver processing plant, a tailings impoundment, and ancillary facilities. Actions that have been incorporated into the Proposed Action are the removal of the old Hayden Hill fire tower, location of a new fire tower on Snag Hill, location of a powerline corridor from the Adin substation along the east side of Highway 139 to the Hayden Hill access road, and the Hayden Hill Resource Plan (Resource Plan) which is a County General Plan Amendment. The Project would be located at a site in northern Lassen County shown on Figure 1.0-1.

1.1 Project Organization

The Project involves private and Federal lands, and requires County, State, and Federal approval. Lassen County will serve as the lead State agency under the California Environmental Quality Act (CEQA). The County will work cooperatively with the lead Federal agency, which is the Alturas Resource Area, Susanville District Office of the U.S. Department of Interior, Bureau of Land Management (BLM). The Modoc National Forest, U.S. Department of Agriculture, Forest Service (USFS), is a cooperating agency. The jurisdiction of the BLM and the USFS requires Project compliance with certain Federal policies and regulations including the National Environmental Policy Act (NEPA) and applicable Council of Environmental Quality (CEQ) provisions. In this document, Lassen County is identified as the lead State agency for preparation of the joint EIR/EIS document and administration of the environmental review of the Project.

The BLM, the USFS and Lassen County entered into a Memorandum of Understanding (MOU), dated May 16, 1989, to coordinate their efforts in complying with State and Federal review requirements by cooperating to produce a single EIR/EIS document. The MOU called for the formation of a Joint Steering Committee with representatives from Lassen County, the BLM and the USFS, to act in an advisory capacity on the character of the EIR/EIS. The role of the Joint Steering Committee as defined in the MOU is to, "Review the organization, scope, issues, alternatives, and content of the EIR/EIS to ensure that the requirements of State and Federal laws are satisfied and that the statutory findings required of the local agencies for their respective decisions on the Project can be justified."

The Steering Committee further defined this role by stressing their control of the contents of the document; by maintaining the EIR/EIS as a strict third party document; and by setting up a system of review that allowed open communication between the Applicant, the Steering Committee and the third party preparer while still maintaining control of the content. This EIR/EIS document was prepared under a third-party agreement between Lassen County and Steffen Robertson and Kirsten (U.S.), Inc. (SRK), signed February 9, 1990.

1.2 EIR/EIS Implementation Process

In order to comply with both the CEQA and NEPA regulations, certain procedures are followed to ensure adequate review of a proposed action prior to operation. These procedures are described below.

Generally, CEQA requires that the lead agency (the County) engage in the following analyses to ascertain whether an EIR is necessary: 1) determination of whether the project is subject to CEQA; 2) an Initial Study to determine whether the project may have a significant effect on the environment; and 3) depending upon the results of the Initial Study, either the preparation of a Negative Declaration or the determination that an EIR must be prepared.

Immediately upon determining the need for an EIR, the lead agency must prepare a Notice of Preparation (NOP) describing the project sufficiently to enable the Responsible Agencies to make a meaningful response. Distribution of the NOP to the Responsible Agencies initiates a 30-day review and comment period.

Submitting a Plan of Operations (POO) initiates the NEPA compliance process which requires the BLM, the lead Federal agency, to evaluate environmental concerns during review of the POO. The Hayden Hill Project was determined at the outset to have sufficient environmental impact to require an EIS. The USFS was asked to be a cooperating agency on the Steering Committee because they are adjacent land managers and certain aspects of the Proposed Action would have direct and indirect impacts on USFS property (i.e., Right of Way and other special use permits).

The procedures for the Project EIR/EIS process are summarized as follows:

- Notice of Intent and Notice of Preparation - Public notifications to prepare an EIR/EIS. The Notice of Intent (NOI) for the proposed Hayden Hill Project was published in the Federal Register on November 6, 1989 by the BLM and on November 2, 1989 by the USFS. The Notice of Preparation (NOP) was distributed to State agencies and local organizations in November of 1989. A copy of the NOP is included in Appendix A.

- Interagency Scoping Meetings - Interagency scoping meetings were held on February 2, 1990 and March 20, 1990. The meetings included members of the Steering Committee and representatives from Responsible and Trustee Agencies. Oral and written statements resulting from these meetings were incorporated into a preliminary list of major Issues, Concerns, and Opportunities (ICOs).

- Public Scoping Meetings - A public scoping meeting was held on November 16, 1989 in Susanville and a public workshop was held on November 30, 1989 in Adin, to solicit input from interested individuals, groups, agencies, and elected officials. These meetings were announced by: 1) notices to local newspapers; and 2) direct mailing of notices to identified concerned agencies, organizations, and property owners in the vicinity of the Project. Items or issues to be addressed as part of the EIR/EIS were compiled from oral and written statements. A public scoping notification is included in Appendix A.

- Preparation of the Preliminary Draft EIR/EIS - A Preliminary Draft EIR/EIS was prepared for the Steering Committee to review before preparation of the Draft EIR/EIS.

- Preparation of the Draft EIR/EIS - The Draft EIR/EIS was prepared to identify, describe, and analyze the environmental issues of the Proposed Action and alternatives.

- Notice of Completion and Draft EIR/EIS Register Publication - Lassen County sent the Notice of Completion to the State Clearing House. State review began on April 9, 1991. Notices of Availability were published in the Federal Register by the BLM on April 11, 1991 and by the EPA on April 12, 1991.

- Public Release of the Draft EIR/EIS for Review and Comment - The Draft EIR/EIS was released to the public and concerned agencies for a 45 day review and comment period, beginning on April 12, 1991 and ending on May 28, 1991.

- Public Meetings - Public meetings were held during the 45-day Draft EIR/EIS review period to provide the public with an opportunity to verbally comment on the document. The meetings were held on May 1, 1991, in Susanville and May 2, 1991 in Adin.

- Preparation of the Final EIR/EIS - A Final EIR/EIS has been prepared, which incorporates the response to written public comments received as a result of public review of the Draft EIR/EIS. Chapter 12.0 of the Final gives direct responses to each comment letter received.

- Record of Decision/Notice of Determination - After publication and circulation of the Final EIR/EIS, and a 30-day waiting period, the BLM will make its decision regarding the Proposed Action and prepare and publish a Record of Decision. The USFS will issue a Record of Decision at the same time as the BLM. Lassen County will hold a public hearing to review the Project proposal, the County supervisors certify the adequacy of the Final EIR/EIS, make their decision regarding the Proposed Action, and the County prepares and files a Notice of Determination.

1.3 Purpose of and Need for the Proposed Action

1.3.1 Hayden Hill Project

The purpose of the proposed Project is twofold: To extract gold and silver ore from an open pit mine and to process the ore to produce an economically salable product. This document responds to the submittal of a POO, a Reclamation Plan, and an application for a Conditional Use Permit (CUP) by LGMI.

The ore will be processed by milling and heap leaching techniques. Heap leaching is designed to recover precious metals from low-grade ores that could not be recovered economically using conventional milling techniques. The heap leach technology to be used at Hayden Hill is well understood and is widely accepted. Currently, there are 15 heap leach operations in California (California Division of Mines and Geology 1990). Chapter 2.0 describes the heap leach process in detail.

Lassen Gold Mining, Inc. submitted an application for a CUP and a Reclamation Plan to Lassen County on August 23, 1989. The CUP application was accepted by the County on September 22, 1989. An Initial Study was conducted by the lead State agency and it was determined that an EIR was necessary to evaluate the potential significant effects of the Project on the environment. A copy of the Initial Study is included in Appendix B.

Lassen Gold Mining, Inc. also submitted a POO to the BLM (August 23, 1989) for the Project. Approval of the POO and subsequent project activities may have a significant effect on the quality of the environment. Therefore, an EIS was required to evaluate potential significant environmental effects before a decision on the POO is made. To facilitate these processes a joint EIR/EIS was agreed to in the MOU, as explained in Section 1.1.

Most of the public lands that would be affected by the Project are lands managed by the BLM. These lands include unpatented lode and placer mining claims. In addition, a small area consisting of patented claims on private (fee) lands is within the Project area. In the case of mineral development projects on public lands and issuance of mining claims, "need" is established by the Federal government. United States mining laws, and the regulations by which they are enforced, recognize the statutory right of mining claim holders to develop Federal mineral resources, as long as undue environmental degradation is not incurred. Further, such development is encouraged and is consistent with the Mining and Mineral

Policy Act of 1970 and the Federal Land Policy and Management Act of 1976. These regulations require responsible Federal agencies to review the Applicant's POO to ensure that:

- Adequate provisions are included to minimize, where feasible, adverse environmental impacts to surface resources on public lands;
- Measures are included to provide for reclamation, where practicable; and
- The proposed operations will comply with other applicable Federal and State laws and regulations.

1.3.2 Hayden Hill Resource Plan

It is recommended that the reader obtain a copy of the Draft Hayden Hill Resource Plan to review in conjunction with Chapter 5.0 of the EIR/EIS, which assesses environmental impacts of the Resource Plan. Although Chapter 5.0 summarizes the contents of the Resource Plan, it is important to have the complete text of the goals, policies and objectives to understand the changes to the text proposed in the mitigation measures. The Hayden Hill Resource Plan is available for review at: the Lassen County Planning Department and the Lassen County Free Library in Susanville, and the Beiber Library in Beiber, California.

Lassen County, as the lead State agency for CEQA compliance, does have jurisdiction over mining on State lands and limited jurisdiction on Federal lands. Land uses on private lands, including mining, must comply with Lassen County zoning, health, sanitation, building, and environmental regulations. All mining activities, including those on Federal lands, must also comply with California Surface Mining and Reclamation requirements. Currently, the Lassen County General Plan and Zoning Ordinance allows development of mining resources at Hayden Hill with a Conditional Use Permit. The Resource Plan was prepared for Lassen County to provide updated guidelines and performance standards for development of mineral resources at Hayden Hill. The Hayden Hill Resource Plan has two purposes:

- To compile an inventory of information on land use, circulation, housing, conservation, open space, noise, and public safety at Hayden Hill and in the vicinity; and
- To provide the policy framework, including goals, objectives, and policies, for development of mineral resources at Hayden Hill in concert with the management of other area resources.

The Resource Plan provides guidance to evaluate the Project proposed by LGMI, as well as any future mineral extraction development proposals at Hayden Hill. Any mineral resource development at Hayden

Hill must be consistent with the goals, policies, and objectives of the Hayden Hill Resource Plan. The seven elements of the Resource Plan are: Mineral Resources; Land Use; Circulation; Housing; Conservation/Open Space; Noise; and Safety.

The Hayden Hill Resource Plan is an amendment to the Lassen County General Plan, which was adopted initially in November 1968 and revised in 1972. Since adoption of the original General Plan, two elements have been adopted: the Housing Element in December 1986 and the Noise Element in 1989. The County has also adopted a series of area plans, including plans for the Susanville Vicinity, Eagle Lake, and other identified planning areas. Like the Hayden Hill Resource Plan, these area plans contain goals, policies, and objectives specifically for development in the area within the overall goals of the General Plan. An area plan differs from a resource plan in that an area plan addresses the general planning area. An area plan is primarily concerned with addressing planning issues of a community or special planning area. A resource plan is primarily concerned with addressing planning issues related to the development of a particular resource within a specific planning area. Text changes for the Lassen County General Plan accompany the Resource Plan. The text changes are required to achieve consistency between the General Plan and the Resource Plan.

1.4 Project Background

Hayden Hill has been the site of mining and exploration since 1869 when the discovery of gold led to the opening of the northern territory of Lassen County. The small town of Hayden Hill was established, and by 1885 boasted a population of approximately 500 people, most of whom worked in the eight to ten active mines in the area. Gold mining activities in the area continued intermittently into the 1900's. Within the past 13 years, the area has experienced a resurgence of interest in precious metals mining and has been intensively explored by a number of companies. Approximately 200 acres of surface disturbance exists in the planning area as a result of past mining and exploration activities.

The Hayden Hill Gold Venture was formed in late 1988 between LGMI (a subsidiary of Amax Gold Inc.) and Hayden Hill Gold Mining Company (a subsidiary of U.S. Gold Corporation) in order to explore the precious metals potential at Hayden Hill. The manager of the Project for the joint venture was Hayden Hill Operating Company, Inc. (a subsidiary of Amax Gold Inc.). Hayden Hill Gold Mining Company sold its interest in the Hayden Hill Project to LGMI in March 1990, and the Project is now owned and operated by LGMI.

Hayden Hill Gold Venture initiated an exploration drilling program at Hayden Hill in late 1988. Since then, over 300 reverse circulation holes have been completed, totalling approximately 200,000 feet. In addition, nine diamond drill holes were completed for metallurgical testing. Exploration drilling delineated economically viable reserves of sufficient quantity and quality to warrant detailed engineering feasibility studies and initiation of permitting activities under the CEQA and NEPA processes.

To date, three POOs and one NOI (for 5 acres or less of disturbance) have been submitted for drilling and construction of roads at the Project. The first POO was submitted in late 1988 for exploration drilling operations. All POOs met the requirements of the BLM and were approved. All approved POOs and the NOI are on file at the Alturas Resource Area BLM office. Drilling activities will be ongoing as the Project progresses through the feasibility/permitting process and into early development and operations under a current exploration POO dated May 4, 1990.

A Borrowers Environmental Report has been prepared for the powerline corridor along the east side of Highway 139 from the Adin substation to Hayden Hill Road, the access road. The powerline corridor information has been incorporated in the Proposed Action and appropriate areas of this document since it was determined to be a connected action.

The Hayden Hill Resource Plan was developed to respond to the interest expressed by LGMI to extract gold and silver from Hayden Hill. The Resource Plan establishes goals, policies, and objectives to guide the development of mineral resources at Hayden Hill. Through the Resource Plan, Lassen County provides for the short-term development of mineral resources at Hayden Hill. In the long-term, following reclamation, land use at Hayden Hill will be restored to livestock grazing, watershed protection, wildlife habitat and to a lesser degree, upland recreation.

1.5 Project Overview

1.5.1 Project Location and Access

The Project is located in Lassen County, 204 air miles northeast of Sacramento, California, 120 air miles north-northwest of Reno, Nevada, and 15 air miles south of Adin, California. The site is reached from Susanville, California, the County seat, by driving 54 miles north-northwest on California Highway 139 and four miles southwest on a County administered dirt/gravel road called Hayden Hill Road (Figures 1.0-1 and 1.5-1). The mineral deposit lies within Hayden Hill in the Hayden Hill mining district. Commercial truck traffic making deliveries to the mine will be directed to use Highway 395 to the Termo-Grasshopper cut-off as their primary route, thus avoiding Eagle Lake and limiting travel along Willow Creek.

1.5.2 Project Area

The Project site boundary encompasses approximately 2822 acres of Federal and private lands largely controlled by LGMI. Project activities are proposed to occur on portions of the following sections: Sections 1, 2, 3, and 4 T36N, R9E; Sections 5 and 6 T36N R10E; Sections 1, 2, 12, 13, 24, 25, 35 and 36 T37N, R9E; Sections 7, 18, 19, 20, 29, 30, 31, and 32 T37N, R10E; Sections 4, 9, 10, 15, 22, 27, 34 and 35 T38N, R9E; Sections 21, 28 and 33 T39N, R9E; and, Section 11 T36N, R8E. The primary mine facilities center within a 1920 acre area (three sections), with three access/utility corridors extending from this central zone. Table 1.5-1 is a summary of Project area disturbance and land status of each disturbance due to the proposed Project. Approximately 950 acres within the Project site boundary would be disturbed by proposed mining activities. Approximately 200 acres of existing disturbance are within the Project area. The proposed disturbed area represents 34% of the area within the Project site boundary.

1.5.3 Resource Plan Area

The planning area for the Hayden Hill Resource Plan covers a portion of the Project area. The Hayden Hill Planning Area is identified on Figure 1.5-2, Planning Area Location Map. This area is located approximately 54 miles northwest of Susanville, the County seat, and west of State Highway 139. Access to Hayden Hill is from Highway 139 and Hayden Hill Road, a County-administered dirt and gravel road. The planning area is comprised of four sections of land approximately 2,500 acres in size. A smaller section of land, approximately 225 acres in size, extends north of the 2,500 acre area. The boundaries also include a corridor approximately 200-foot wide along the Hayden Hill Road right-of-way, leading from the northeast section to State Route 139. The Hayden Hill Road Corridor is about 40 acres. Total acreage for the planning area is approximately 2,765 acres.

1.5.4 Land Status

The land status of the Project Area is a complex combination of private surface and minerals (including some patented mining claims), private surface and Federal minerals (Stock Raising Homestead Act lands), and Federal surface and minerals (administered by BLM and USFS). Lassen Gold Mining, Inc. presently controls 391 unpatented lode, placer and millsite claims, and nine patented mining claims and millsites on and surrounding the ore body and in and around the Project area (Figure 1.5-3). Lassen Gold Mining, Inc. controls, by ownership, lease, purchase, or option agreements, all of the mineral rights and all of the surface rights necessary for the Project. Negotiations are in progress for the few remaining surface rights. The acreages of private, BLM administered and USFS administered land that will be disturbed by the Proposed Action are summarized in Table 1.5-1.

TABLE 1.5-1
SUMMARY OF SURFACE DISTURBANCE AND LAND STATUS AT HAYDEN HILL

Component	Total Disturbed Acres	Private (Disturbed Acres)	BLM Administered (Disturbed Acres)	USFS Administered (Disturbed Acres)
Pit	176	90	86	
Waste Rock Dump	202	38	164	
Auxiliary Dump Facilities	4	1	3	
Topsoil Storage Areas (Growth media Stockpiles)	22	13	9	
Mill/Crusher Process Complex (Including office/shop facilities)	68	57	11	
Tailings Impoundment	131	131		
Process Ponds	23	23		
Leach Pad	199	78	121	
Roads				
Haul Roads	31	25	6	
Access Road	63	45	1	17
Service Roads/Water Pipeline	22	10	1	11
Power Line (where not along access road)	9	7	2	
TOTAL (over mine life)	950	518	401	31

1.5.5 Project Schedule

The construction phase of the Project would begin following receipt of required permits. The Project is currently scheduled to begin construction in late-1991, and to begin mining operations by the end of 1991. Proposed rates of mining are approximately 20,000 tons per day (tpd) of ore and 40,000 tpd of waste rock. The mill facility will be designed to handle 3,500 tpd. Mining is proposed to be carried out 20 hours per day, six days per week, 302 days per year; ore processing will operate 24 hours per day, 365 days per year. The proposed Project life is estimated at eight years.

1.5.6 Resource Plan Schedule

The Hayden Hill Resource Plan was developed for Lassen County's review and consideration as a General Plan Amendment in association with the Project proposal. The public review process for the Resource Plan was concurrent with the public comment period for the Project EIR/EIS. To encourage public comment, the Draft Hayden Hill Resource Plan was released when the Draft EIR/EIS was released, for a review and comment period of 45 days. During the public comment period, public hearings on the Resource Plan were held by the Planning Commission. The Planning Commission forwarded the Resource Plan to the Board of Supervisors with their recommendations. The Board of Supervisors can take action to approve the Resource Plan after the EIR part of the EIR/EIS on the Resource Plan is certified. With the policy framework in place, the proposed Hayden Hill Project can be considered.

1.6 Environmental/Regulatory Compliance

This Final EIR/EIS has been prepared in compliance with the following regulations and guidelines: 1) The National Environmental Policy Act of 1969 (Pub. L. 91-90, 42 USC 4321 et seq; 2) BLM procedures for implementing CEQ regulations (40 Code of Federal Regulations [CFR] 1500, et seq.), as they relate to NEPA; 3) procedures for preparing Environmental Impact Statements, BLM Manual (NEPA Handbook, USBLM 1988); 4) regulations for surface management of public lands under U.S. Mining Laws (43 CFR Part 3809); 5) California Environmental Quality Act (Public Resources Code, Section 21000, et seq.); 6) Lassen County procedures for implementing the CEQA Guidelines, as amended, (California Administrative Code, Section 15000, et seq.); and 7) the California Surface Mining and Reclamation Act of 1975 (SMARA) (California Public Resources Code, Chapter 9, Division 2).

In addition to compliance procedures involved in the preparation of this document, as outlined above, a number of other permits and approvals are required before the proposed Project activities can begin. Table 1.6-1 is a preliminary list of environmental permits and approvals required for constructing and operating the Project. This should not be considered a complete list of all required permits.

1.7 Intended Uses of the EIR/EIS

Both CEQA and NEPA require a thorough, objective, and quantitative analysis of the impacts associated with proposed projects. Due to the size and nature of the proposed Hayden Hill gold mine and mineral processing operation, significant impacts may be associated with this Project. Because the Final EIR/EIS is a joint Lassen County/BLM/USFS document, it will have several functions as described below.

This Final EIR/EIS: 1) identifies potential significant effects of the proposed Project on the environment; 2) identifies alternatives to the proposed Project; and 3) describes how significant effects can be mitigated or avoided. This report has been prepared to enable public agencies, and the public in general, to evaluate the Project and determine whether there will be a significant effect on the environment, and to initiate and analyze methods of reducing adverse effects.

On a Federal level, an EIS is normally required for any non-coal surface mine impacting more than 640 acres, in accordance with Department of Interior guidelines (516 DM6, Appendix 5.3 [A] [9]). NEPA requires an EIS to review, approve, and condition the POO for a proposed project. The BLM as lead Federal agency for NEPA compliance will use the Final EIR/EIS to take action on the Project POO. The BLM is required by Federal regulations to approve any operations as long as such activities will not cause unnecessary or undue degradation to the public lands. Mining related activities such as water pipeline and power line routes outside the area of operation require right-of-way authorization. These ancillary operations must also be in the public interest before BLM and USFS approval.

The California Environmental Quality Act and SMARA mandate an EIR as part of the review process for a CUP and a Surface Mining Permit and Reclamation Plan. The Lassen County Planning Department, Planning Commission, and Board of Supervisors will use the Final EIR/EIS document to consider the General Plan Amendment, which includes the Hayden Hill Resource Plan, and the CUP application for the Project. Assessment of the potential environmental impacts of implementing the goals, policies, and objectives of the Hayden Hill Resource Plan is included as part of this joint EIR/EIS on the Project. The EIR part of the document is intended to meet CEQA requirements, and contains the required CEQA sections to address the Resource Plan. Table 1.7-1, Index for Locating Resource Plan EIR Sections Required by CEQA, lists the location in this EIR/EIS of sections required by CEQA. For this purpose, the County is the lead agency for CEQA compliance. The County is also responsible for implementing SMARA and for approval of the proposed site plan in accordance with the County Development Code.

TABLE 1.6-1 SUMMARY OF PERMITS AND APPROVALS REQUIRED FOR THE HAYDEN HILL PROJECT*

Agency	Permit/Approval	Facet of Project	Time Requirement	Comments
FEDERAL				
Bureau of Land Management (BLM) and United States Forest Service (USFS)	Approval of Plan of Operation (Requires EA or EIS)**	All activities on unpatented mining claims on BLM land or involving right-of-way on BLM land. Road construction.	120 - 180 days	If an EIS is required, could take 365 days or longer. Public notice required.
	Right-of-Way Permit or Special Use Permit	Water and powerline corridors to site. Lookout pit construction	90 - 120 days	Data in Plan of Operations and EIS can be used for this application.
	Environmental Impact Statement	Environmental Compliance		
	Cultural Resource Permit	Authorizes Section 106 Field Investigation	30 days	Issued for fieldwork authorization
Department of the Army, Corps of Engineers	Dredge and Fill Permit (U.S. Army Corps of Engineers 404/Wetlands Permit)	Disturbance of or placement of fill material in wetlands.	60 - 90 days	If required will be an individual or Nationwide permit.
Department of Justice, Bureau of Alcohol, Tobacco, and Firearms	Purchase and Storage of Explosives Permit	Purchase of explosives in one state for use in another		
Department of Labor, Mine Safety, and Health Administration	Miner Training Plan (Title 30, Subchapter H, Part 48, Subpart B)			Training by certified instructors is mandatory for all personnel
	Emergency fire, evacuation and rescue plans	Separate plans required for surface and underground operations		
	Notice of Start of Operations	Notice must be filed prior to start of operations		
	Record of Inspection of Self Propelled Equipment (55.9-1)	Must be maintained for 6 months and available to inspectors		
Advisory Council on Historic Preservation (ACHP)	Section 106 Compliance	Approval of Site Treatment Plan	20 days	Issued after concurrence of SHPO

NOTE: This is not to be considered a complete list of all permits required.
* Not all of the permits listed may be required, depending upon the project design.
** These applications will trigger review by other agencies such as Dept. of Fish and Game and State Historic Preservation Office.

TABLE 1.6-1 (continued). PRELIMINARY SUMMARY OF PERMITS AND APPROVALS REQUIRED FOR THE HAYDEN HILL PROJECT

Agency	Permit/Approval	Facet of Project	Time Requirement	Comments
Fish and Wildlife Service	Section 7 Consultation	Review of Biological Assessment on Threatened or Endangered Species that may be impacted by the Proposed Action	90 days	A Draft Biological Opinion has been received (Appendix N). The BO states that the Project is not likely to jeopardize the existence of Modoc sucker.
STATE				
Cal-OSHA	**Notification of Mine Opening**			
California Chemical Emergency Planning and Response Commission	**Notice of Emergency Hazardous Material**			
Regional Water Quality Control Board	**Waste Discharge Requirements**	Tailings and heap leach facilities. Design, operational, cyanide neutralization and closure criteria.	120 days	Review of geotechnical design criteria to verify zero discharge operation. Bond(s) required. Public notice/hearing required.
	National Pollution Discharge Elimination System (NPDES) Permit	Any discharge of wastewater to surface water (i.e., sediment control facilities).	120 days	Review of geotechnical design, will involve Public Notice; may be reviewed by federal EPA.
Department of Fish and Game	**Streambed Alteration Permit 1603**	Culvert installation crossing Willow Creek		
	CESA consultation	T+E species		
	Road kill removal	Access road haul roads.		
State Historical Preservation Office (SHPO)	Section 106 Compliance	National Register eligibility, Site Treatment Plans, Native American concerns	30 days +	Will be required
California Department of Forestry and Fire Protection	Relinquish Fire Tower	Pit excavation		

NOTE: This is not to be considered a complete list of all permits required.

* Not all of the permits listed may be required, depending upon the project design.

** These applications will trigger review by other agencies such as Dept. of Fish and Game and State Historic Preservation Office.

TABLE 1.6-1 (continued). PRELIMINARY SUMMARY OF PERMITS AND APPROVALS REQUIRED FOR THE HAYDEN HILL PROJECT

Agency	Permit/Approval	Facet of Project	Time Requirement	Comments
COUNTY				
Lassen County Board of Supervisors	**Hayden Hill Resource Plan**	Policy framework for project consideration.	45 - 60 days	Plan EIR (Part of the Project EIR/EIS)must be certified and Resource Plan approved before Project can be considered.
	Conditional Use Permit (CUP)	All surface disturbance; land ownership zoning.	60 - 120 days	Reclamation plans will be carefully reviewed, as well as overall effect on the county and compatibility of project with existing land use plans.
	Environmental Impact Report	Environmental compliance	365 days +	EIR addresses CUP, reclamation plan and General Plan Amendment for the Hayden Hill Resource Plan.
	Surface Mining Operating Permit (Reclamation Permit)	All surface disturbances and proposed reclamation plan.	30 - 60 days	Requires a bond for disturbed acreage; permit must be reviewed annually.
	Building Plan Approval	Compliance with appropriate codes and standards		
	Building Permits	Fire safety, building safety, compliance with appropriate codes and standards		
	Approval of Mining/Reclamation Plan	Satisfaction of Surface Mining and Reclamation Act		
	Purchase and Use of Explosives	Proper storage and handling, possibly bonding		

NOTE: This is not to be considered a complete list of all permits required.
* Not all of the permits listed may be required, depending upon the project design.
** These applications will trigger review by other agencies such as Dept. of Fish and Game and State Historic Preservation Office.

TABLE 1.6-1 (continued). PRELIMINARY SUMMARY OF PERMITS AND APPROVALS REQUIRED FOR THE HAYDEN HILL PROJECT

Agency	Permit/Approval	Facet of Project	Time Requirement	Comments
Lassen County Air Pollution Control District	**Authority to Construct (ATC)**	Air Pollution Source Location and Control. All aspects that produce air contaminants including construction, mining, heap leaching, and burning combustible trash.	30 - 60 days	May require submission of plans and specs for air pollution control facilities.
	Permit to Operate	Air pollution operational and monitoring requirements, emissions limits established.	60 - 90 days	The Federal EPA may review all air quality permits.
Lassen County Department of Environmental Health	**Air Tanks Emission (Inventory)**	Once facility is in operation	1 day	
	Business Plan	Hazardous material	1 day	
	Acutely Hazardous Materials Registration Form	Cyanide		
	Sewage Disposal Permit	Sewage		

NOTE: This is not to be considered a complete list of all permits required.
* Not all of the permits listed may be required, depending upon the project design.
** These applications will trigger review by other agencies such as Dept. of Fish and Game and State Historic Preservation Office.

This Final EIR/EIS will be used by local, State, and Federal agencies in their consideration of approval of various discretionary permits for the proposed Project. These agencies, such as the California Department of Fish and Game (CDFG), are defined as Responsible or Trustee Agencies by the CEQA guidelines and will receive review copies either through the EIR distribution list or through distribution of the document by the California Clearinghouse.

1.8 Scoping Process

The environmental review procedures that guide the preparation of the Final EIR/EIS are prescribed by CEQA, NEPA, and CEQ and require both interagency and public involvement. This "scoping process" is utilized to identify the range of actions, alternatives, mitigation measures, and significant effects to be analyzed in depth in the EIR/EIS. It should also eliminate from detailed study issues found not to be of consequence. The scoping process includes a forum for public notice and comment.

1.8.1 Public Notifications

The Lassen County Planning Department and the BLM as the lead agencies for the EIR/EIS preparation have conducted the following Public Notifications. Public scoping meetings were held on November 16, 1989 in Susanville and a public workshop was held on November 30, 1989 in Adin, to solicit input from interested individuals, groups, agencies, and elected officials. Notices were published in the Lassen County Times and the Mountain Echo on November 7, 1989 and the Modoc County Record on November 9, 1989. These meetings were announced by direct mailing of notices between October 27 and November 7, 1989, to concerned agencies, organizations, and property owners in the vicinity of the Project . Items or issues to be addressed as part of the EIR/EIS were compiled from both oral and written statements. Copies of public scoping notifications are included in Appendix A. A Notice of Intent was published in the Federal Register by the BLM on November 6, 1989 and by the USFS on November 2, 1989. The Notice of the Draft EIR/EIS availability was published in the Federal Register on April 11, 1991 under the BLM and on April 12, 1991 under the EPA. The Lassen County Planning Department published a public meeting notice for the Draft EIR/EIS in the Lassen County Times on April 23, 1991.

1.8.2 Interagency Scoping

Lassen County, the BLM, the USFS, and the Applicant have solicited input from interested parties and individuals throughout the Project planning and scoping process. Interagency scoping meetings for the Hayden Hill Project were held on February 9, 1990 in Susanville and on March 20, 1990 in Alturas at the BLM office. At the first meeting, all members of the Joint Steering Committee were present. The

TABLE 1.7-1

INDEX FOR LOCATION OF RESOURCE PLAN EIR ANALYSIS REQUIRED BY CEQA

CEQA Sections	Location in EIR/EIS
Summary of Impact and Mitigation	Executive Summary
Project Description	2.0, 5.2
Project Location	1.5.3
Purpose and Need	1.3.2
Description and Characteristics	2.4
Intended Uses of EIR	1.6, 1.7
Schedule	1.5.6
Environmental Setting	3.0
Environmental Impact	5.4
Significant Environmental Impacts	5.4.20
Significant Impacts Which Cannot Be Avoided	5.4.21
Mitigation Measures	5.4
Plan Alternatives	5.3, 5.4.19
Relationship Between Short-Term Uses and Long-Term Productivity	5.4.22
Significant Irreversible Environmental Changes	5.4.23
Growth Inducing Impacts	5.4.24
Cumulative Impacts	5.4.25
Organizations and Persons Consulted	7.0

Joint Steering Committee, and resource specialists, representing several agencies, the Applicant, and the third party preparer attended the second meeting.

A Final Scoping Document dated April 27, 1990, identified major ICOs and initial alternatives based upon written and oral comments received in response to the public and agency scoping sessions described above. Agency responses to the Notice of Intent to prepare an EIR/EIS for the Project provided background information on existing resources and indicated concerns regarding alternative development, impact assessment, mitigation, site monitoring, and reclamation planning.

1.8.3 Results of Scoping

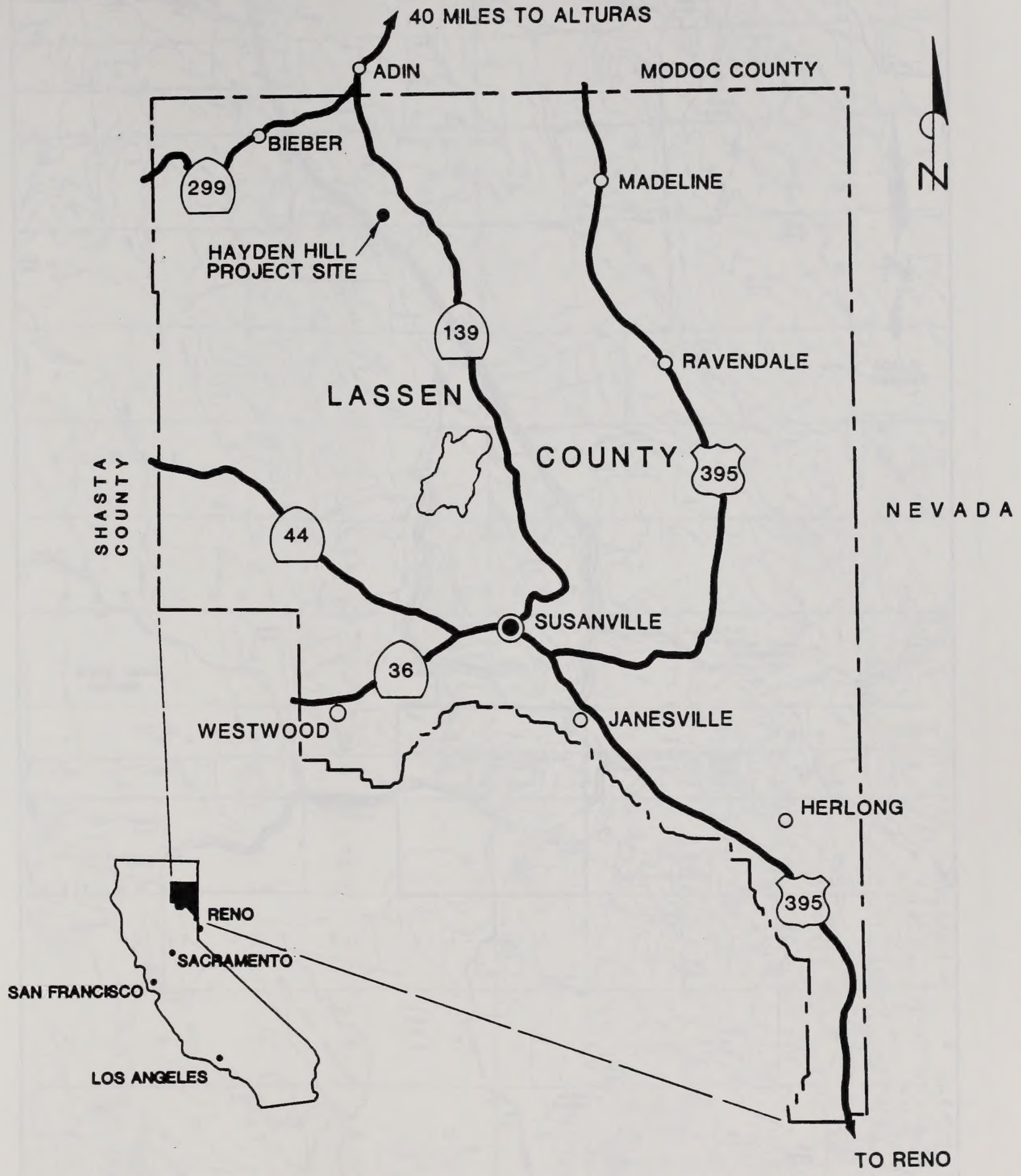
Issues, Concerns, and Opportunities of the proposed Project were varied and numerous. As details of the proposed Project were clarified, a number of ICOs were added. Most of the ICOs focus on the potential environmental impacts associated with the proposed Project and possible Project alternatives. During the scoping period, November 1989 through January 1990, 38 comment letters or statements were received expressing various concerns. Issues concerning wildlife received 22 comments, water quality and quantity received 18 comments, concerns over reclamation received 16 comments, and socioeconomics received 13 comments. Other comments were received on operation and design of the Project, land use, cultural resource protection and value, vegetation and wetlands, transportation and road use, air quality, development of alternatives, visual impact, geotechnical analysis, and cumulative effects. The issue of water rights was raised during the scoping period. This issue has been investigated by legal counsel and is summarized in Appendix C. Copies of the 38 comment letters received throughout the scoping period are available for review at the Lassen County Planning Department.

The ICOs are addressed in Chapter 4.0 of this document in conjunction with a discussion of environmental consequences and proposed mitigation. Chapter 6, Consultation, includes a more detailed discussion of how the ICOs were developed, a Table listing the ICOs and the number of comments for each topic. A number of Project alternatives were considered and evaluated with respect to their effect on the environment. These Project alternatives were developed in part in response to the ICOs. Alternatives including the Proposed Action are discussed in Chapter 2.0 and impacts of alternatives are considered in Chapter 4.0.

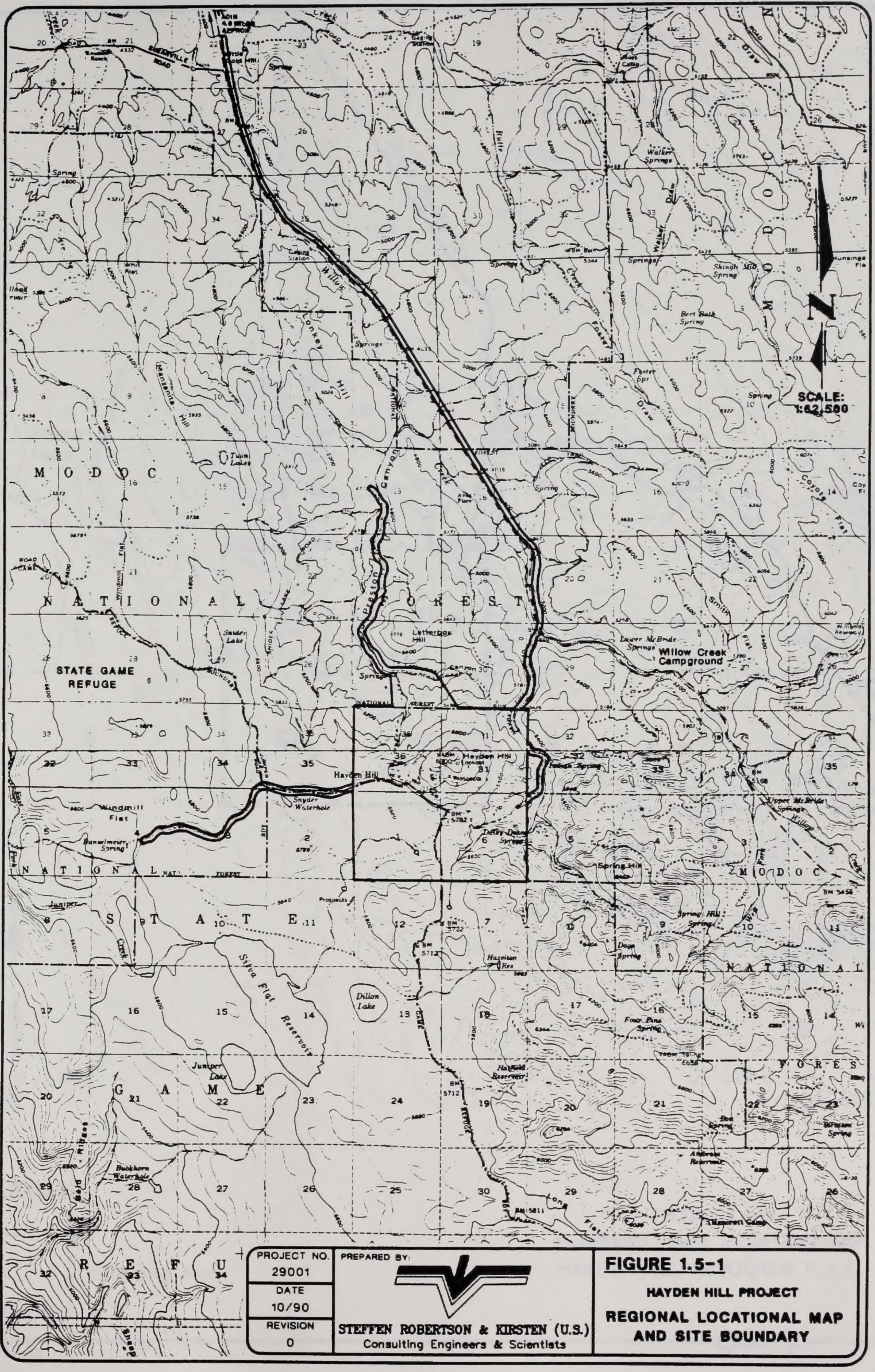
1.9 Consistency with Plans, Policies, Ordinances and Regulations

The Proposed Action is consistent with the USFS and BLM multiple use policies, and with the Lassen County Hayden Hill Resource Plan. Mining activities are consistent with the Forest Service's multiple use planning objectives provided in the Draft Modoc National Forest Land Management Plan (LMP). Mining operations are also consistent with the BLM's multiple land use policy for the Mountain

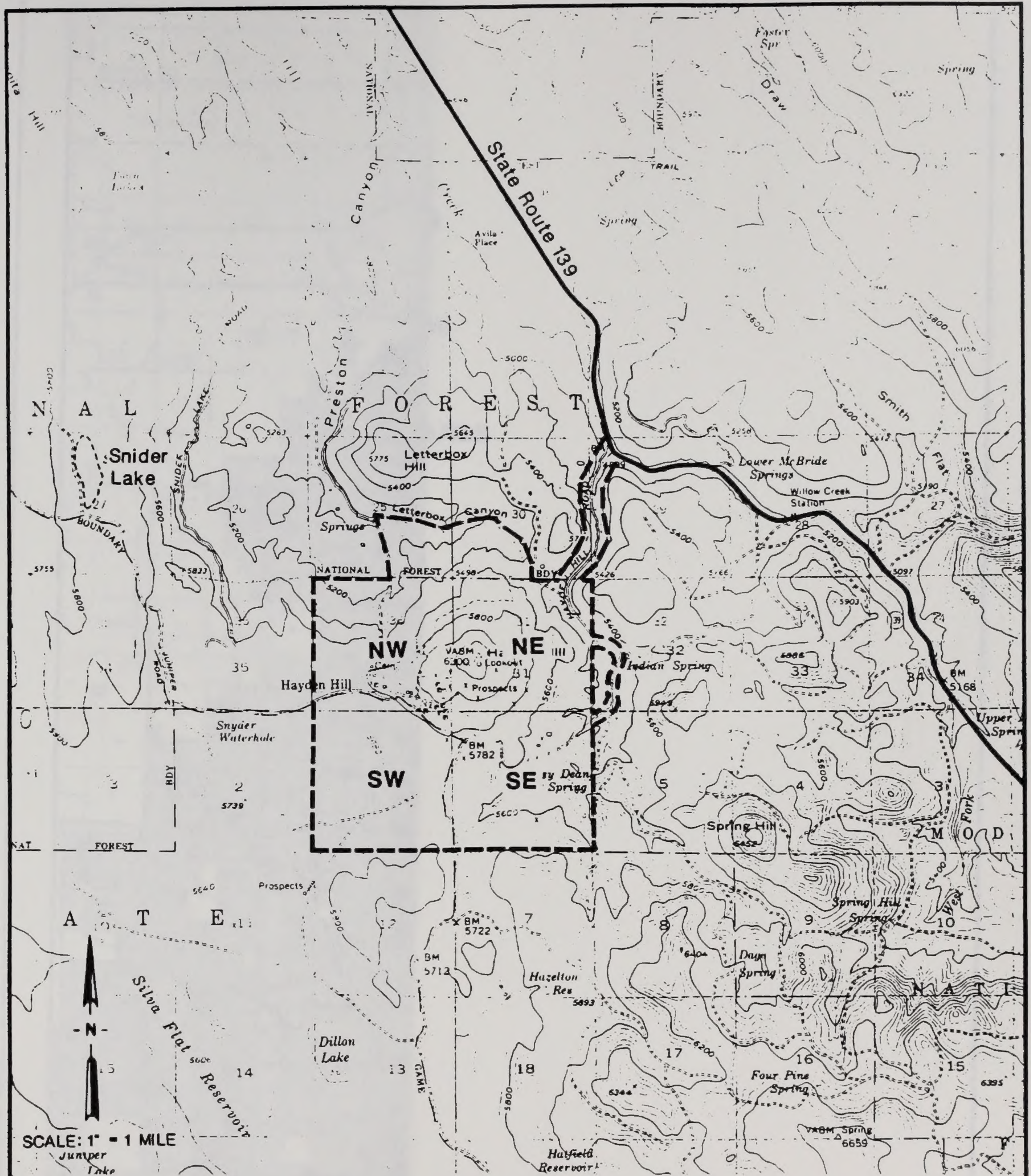
Management Area as described in the Alturas Resource Area Management Plan (RMP). This is discussed in more detail in Section 4.2.9.3. The Proposed Action would develop mineral resources in an area recognized as having potential for gold development. The Hayden Hill Resource Plan is discussed in detail in Chapter 5.0.


40 MILES TO ALTURAS
ADIN
MODOC COUNTY
BIEBER
299
MADELINE
N
HAYDEN HILL PROJECT SITE
139
RAVENDALE
LASSEN
COUNTY
395
SHASTA COUNTY
NEVADA
44
SUSANVILLE
36
WESTWOOD
JANESVILLE
HERLONG
395
RENO
SACRAMENTO
SAN FRANCISCO
LOS ANGELES
TO RENO

PROJECT NO. 29001	PREPARED BY:	**FIGURE 1.0-1**
DATE 7/90		**HAYDEN HILL PROJECT**
REVISION 1 - 11/90	STEFFEN ROBERTSON & KIRSTEN Consulting Engineers	**LOCATION MAP**


ADIN 4.5 MILES APPROX.
SUSANVILLE ROAD
Willow Creek
Walker Springs
Shingle Mill Spring
Bert Bath Spring
Foster Spr
Foster Draw
Donkey Hill
Manzanita Hill
Twin Lakes
Preston Canyon
MODOC
NATIONAL
FOREST
Letterbox Hill
Lower McBride Springs
Willow Creek Campground
Snyder Lake
STATE GAME REFUGE
Hayden Hill
Hayden Hill Lookout
Prospects
Snyder Waterhole
Windmill Flat
Bunselmeier Spring
Indian Spring
Spring Hill
Spring Hill Spring
Upper McBride Springs
Coyote Flat
Smith Flat
Dago Spring
Hazelton Res
Dillon Lake
Silva Flat Reservoir
Juniper Lake
Hatfield Reservoir
Four Pine Spring
Ambrose Reservoir
Buckhorn Waterhole
Long Flat
STATE
GAME
REFUGE
SCALE: 1:62,500
N

PROJECT NO.	PREPARED BY:	**FIGURE 1.5-1**
29001	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	HAYDEN HILL PROJECT
DATE		REGIONAL LOCATIONAL MAP AND SITE BOUNDARY
10/90		
REVISION		
0		

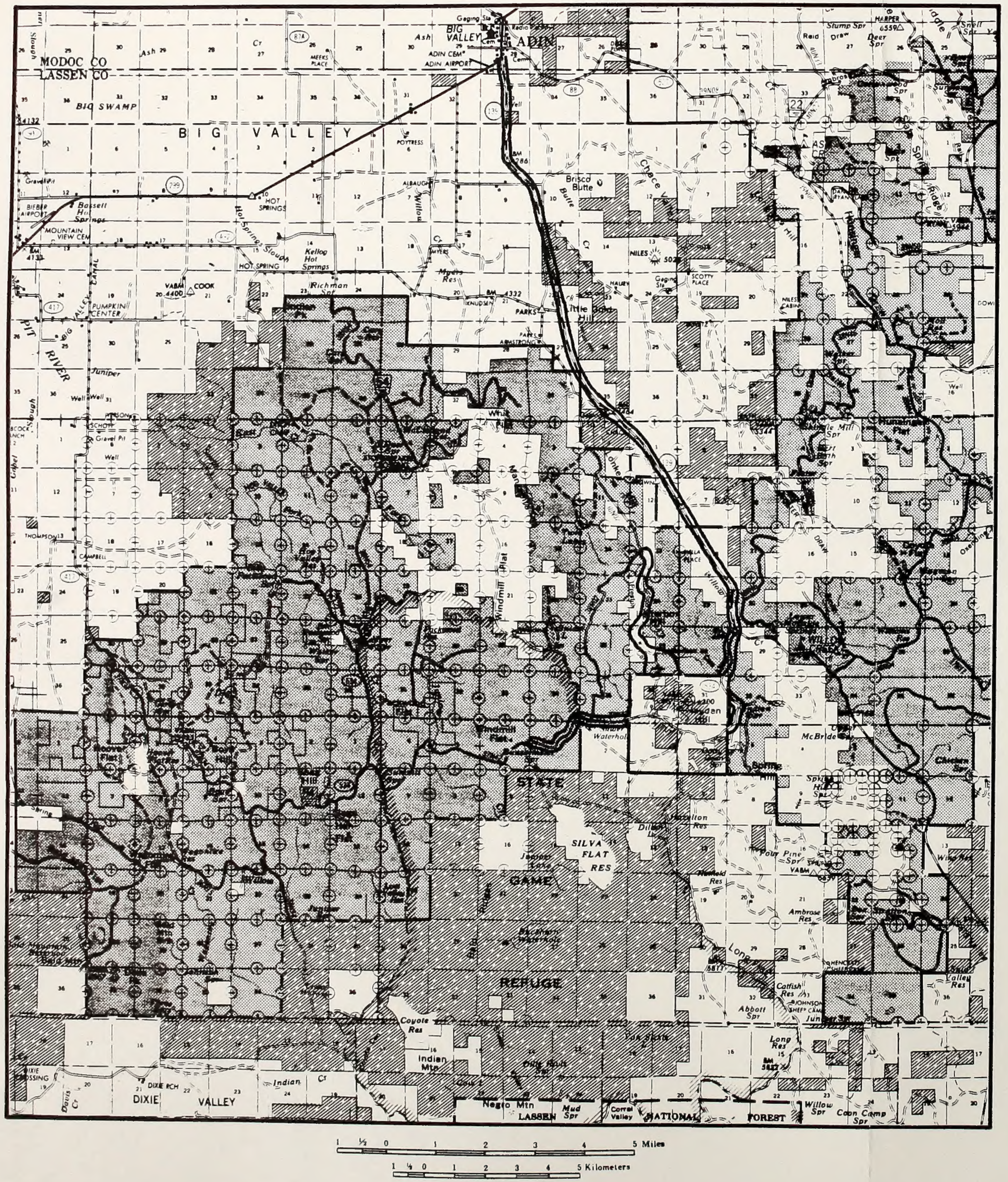

State Route 139
N A L F O R E S T
Snider Lake
Letterbox Hill
Preston Canyon
Letterbox Canyon
Springs
NATIONAL FOREST BDY
NW
NE
SW
SE
VABM 6300
Lookout
Prospects
Hayden Hill
Snyder Waterhole
BM 5782
Indian Spring
Spring Hill
Spring Hill Spring
Dayn Spring
Lower McBride Springs
Willow Creek Station
Smith Flat
BM 5168
Upper Spring
Hazelton Res
Dillon Lake
Silva Flat Reservoir
Hatfield Reservoir
Four Pine Spring
VABM Spring 6659
BM 5722
BM 5712
Prospects
A T E
M O D
N A T I
Avila Place
Foster Spr
Draw
Spring
BOUNDARY
TRAIL
JUNIPER ROAD
GAME
-N-
SCALE: 1" = 1 MILE
Juniper Lake

LEGEND

Planning Area

FIGURE 1.5-2
PLANNING AREA LOCATION MAP
HAYDEN HILL RESOURCE PLAN

RDD31074.AA


MODOC CO
LASSEN CO
BIG SWAMP
BIG VALLEY
ADIN
ADIN AIRPORT
Brisco Butte
HOT SPRINGS
Kellog Hot Springs
PIT RIVER
Juniper
McBride
STATE
GAME
REFUGE
SILVA FLAT RES
Coyote Res
Indian Mtn
Negro Mtn
LASSEN
NATIONAL
FOREST
DIXIE
VALLEY
5 Miles
5 Kilometers

EXPLANTION

▨ **BLM LANDS**

░ **USFS LANDS**

☐ **PRIVATE LANDS**

SOURCE:
U.S.D.A. / U.S.F.S. MODOC NATIONAL FOREST, CALIFORNIA

PROJECT NO. 29001	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	**FIGURE 1.5-3** **HAYDEN HILL PROJECT** **LAND OWNERSHIP MAP**
DATE 11/90		
REVISION 0		

HAYDEN HILL FINAL EIR/EIS
ERRATA SHEET

CHAPTER 3.0

1. Section 3.8.10.3: The information provided in this section was obtained in 1990 and was accurate at that time. However, the county hospital is in a state of flux on a month to month basis. The number of available Physicians accepting new patients is less than is presented here.

CHAPTER 4.0

1. Section 4.2.8.7: **City of Susanville:** Third Paragraph: This paragraph should be replaced with the following: "Due to the current lack of Physicians accepting new patients, the Lassen Community Hospital may not be able to handle all project-related service increases. Services are available in other communities."

APPENDIX E (Reclamation Plan)

1. Section 4.6.5: The statement "Tailings effluents will be detoxified to 0.2 WAD cyanide," should read "Tailings effluents will be detoxified to 0.2 mg/l WAD cyanide."

2. Section 4.10.3: "0.2 mg/kg" should read "0.2 mg/l"

   Note: These Two changes were made in the final Reclamation Plan but were not made in the EIR/EIS due to printing time constraints.

The following page was omitted in the copies distributed on September 25, 1991.

9-4-1 completely enclosed system, section 2.3.1.7, and Environmental Consequences section 4.3.7 is the only system acceptable by today's standards. We note that drip irrigation and enclosed processing systems are now in use, or are proposed for use, in several Western mines, including Bond Gold at Beatty, Nevada and Viceroy Gold in the East Mojave National Scenic Area, California.

Utilities, Buildings:

9-4-2 To prevent residential sprawl, and the additional cost to provide services to a very low density residential area, we recommend that the Project Owner/Operator build and operate the power line, and that it be removed when the mine closes, rather than having the line built by SVEC, section 2.2.7.3, Description of the Environment section 3.8.13 and 3.11.1.2, and Environmental Consequences section 4.2.8.12 and 4.3.5. If this is not done, then the visual impact of the powerline should be reduced by combining it with existing parallel overhead power or telephone lines wherever possible, removing older utility lines as a mitigation for the visual impact, and/or moving the power line away from the highway so it is in the visual background, instead of foreground, Description of the Environment section 3.11.3.3 and 3.11.3.4.

9-4-3 Water is vital in this very dry country. We do not believe that deep aquifers are necessarily completely isolated from shallow "perched" aquifers, as postulated in section 2.2.7.4, Description of the Environment 3.6.3.1 and 3.6.3.2, and Environmental Consequences 4.2.6.3 and 4.2.6.4. These shallow aquifers probably have holes in the bottom due to faulting, thin or missing clay layers, etc. and leak. There should be provision for providing water to the shallow springs if they dry up, permanently if necessary, possibly with wells and windmills.

9-4-4 Buildings and improvements should be painted earth tones, section 2.2.7.5.

9-4-5 We favor Facilities Location Alternative 3, section 2.3.1.4, for the reasons given in Environmental Consequences section 4.3.4.

Note on Possible Alternative uses:

9-4-6 Although post mining uses other than pre mining uses are not usually considered, and perhaps not even acceptable under current law, we believe that at this site, and given that reclamation will not be complete, some consideration should be given to alternate post mine use of the site in section 2.3. At the end of mining, the site will have utilities

9-4

9-4-1 In discussions with Nevada Department of Wildlife personnel, spray drift has no identified impacts and no mortalities have been attributed to spray drift. Prevention of ponding on the heap leach surface is of greater concern than spray drift. At this site the ore will be placed by conveyors which results in a heap with higher infiltration rates than equipment placed ore; thereby minimizing ponding potential. Solution application rates will be adjusted to eliminated ponding regardless of spray or drip application. In regard to enclosed cyanide solutions, netting has proven to be effective in minimizing wildlife mortalities at 95 operating Nevada mines (King and Lamp, 1991). NDOW personnel indicate that while large 2 1/4" grid netting does not exclude small and some medium size birds, the 1 5/8" grid does deter even small passerines from entering the ponds. Also net entanglement is negligible with the smaller size netting. In the Habitat Mitigation and Management Plan, Appendix I, the Applicant agrees to use 1" netting, inspect netting daily, and keep a supply of netting on-site for emergency repairs. Sections 4.2.5.2 Cyanide in Wildlife, 2.2.8.13, Sodium Cyanide and 2.2.3.2 and 2.3.17 in the Proposed Action have been revised or added to address this concern. It has also been discussed in the revised Enclosed Cyanide System Alternatives, Sections 2.3.1.7 and 4.3.7.1.

9-4-2 Long-term growth inducing impacts of the proposed transmission line adjacent to ranching lands may occur as a result of the Proposed Action. Under the Proposed Action, Surprise Valley Electrification Corporation (SVEC) would own and construct the transmission line. As a participant in the Rural Electrification Association, SVEC assists both public and private land owners in accessing the electrical power grid.

Currently, properties along Highway 139, a distance of 11 miles south of the Parks Ranch Road to the Hayden Hill Road are not connected to the electrical power supply grid. SVEC projects such as the one included in the Proposed Action would provide new opportunities for land development to the surrounding rural areas. The significance of this impact varies with the viewpoint and is discussed in Section 4.2.8.9. Please also see Sections 2.2.7.3and 3.8.13.

The electrical transmission line to the site will be combined with existing overhead lines owned by SVEC, from Adin to the junction of A2 and Highway 139. The old overhead phone line on Highway 139 between A2 and the Hayden Hill road will be removed. Please see Section 4.2.11.4 for additional mitigation measures for the power line corridor.

9-4-3 A regionally persistent confining layer overlies the regional groundwater (deep aquifer) system. Moreover, the results of hydrogeologic investigations (pump tests) have indicated that the system is hydraulically confined in the Project area. Thus the recharge area is most likely located some distance from the Project site. Please refer to Section 3.6.3 for a discussion of the hydrogeology of the Project area.

CHAPTER 2.0

ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The following chapter has been prepared in response to and in compliance with the regulations found in 40 Code of Federal Regulations (CFR) Sections 1502.10(e), 1502.14, and California Environmental Quality Act (CEQA) Guidelines [14 CCR Sections 15124 and 15126(d)]. The following sections identify the environmentally preferred alternative, describe the Proposed Action, describe in detail the alternatives which have been considered, present an overview of the environmental impacts and present a summary of those alternatives which have been considered and eliminated from further study.

2.1 BLM and USFS Preferred Alternative/CEQA Environmentally Superior Alternative

The Bureau of Land Management (BLM) and the United States Forest Service, Modoc National Forest (USFS) preferred alternative is the alternative which best fulfills the agencies statutory mission and responsibilities while giving consideration to economic, environmental and technical concerns, and other factors. The CEQA environmentally superior alternative is the Project alternative that is determined to have the least environmental effect other than the No Action Alternative.

The Proposed Action presented consists of several related components which are combined to describe the action. The preferred and environmentally superior alternative consists of the Proposed Action with the following exceptions:

> The waste rock dump on the north side of the site should follow the Complete Benching Alternative (Section 2.3.1.3) as opposed to the Proposed Action. The erosion potential is less and the ability for reclamation is greater. The additional 20 acres of disturbance of Jeffrey Pine/Mountain Shrub vegetation is insignificant in the scope of the Project.
>
> The power supply line will be installed, maintained and owned as outlined in the Power Supply Alternative (Section 2.3.1.5). This alternative limits growth inducing impacts in the power corridor area.
>
> The fire tower will be relocated to the Bieber Museum. The Fire Tower Alternative is described in Section 2.3.1.6 and is preferred over the Proposed Action for its benefit to cultural and recreational resources.

For the rest of the components, the Proposed Action and subsequent mitigation would adequately minimize adverse impacts, would allow the mining operation authorized by the Mining Law of 1872 (30 USC Section 22 et seq) and 43 CFR 3809 and 36 CFR 228 Subpart A regulations, and would not create unnecessary or undue degradation.

2.2 Proposed Action by the Applicant

The following sections present a summary of the Plan of Operations (POO) (HHOC 1989a), Reclamation Plan (SRK 1991) and various design engineering reports prepared by the Applicant for the Project. Figure 2.2-1 is a plan view showing the proposed Project facilities.

2.2.1 Site Construction

Construction and production activities will commence following issuance of final permits. The access road from the pit to the processing facilities will be constructed and haul roads built around the upper portion of Hayden Hill.

Site preparation will begin with clearing and grubbing the area. Commercial timber will be harvested prior to clearing. Brush, stumps, and slash will be placed in windrows and piles to aid in sediment control, added as organic matter to plant growth media stockpiles, chipped for mulch, lopped and scattered, or left in small piles to provide micro-environments for small mammals. Soil will be placed in stockpiles in designated areas for later reclamation. To minimize the potential for erosion, site clearing will proceed incrementally and only those areas needed for near-future construction will be cleared.

Upon relinquishment of the right-of-way (ROW) by the California Department of Forestry and Fire Protection (CDFFP), the fire lookout tower located at the top of Hayden Hill will be disassembled and relocated to the Bieber Museum. A replacement tower will be constructed on Snag Hill prior to the removal of the existing tower. Snag Hill is located approximately nine miles west of Hayden Hill. The new tower would be constructed at an elevation of approximately 6,072 feet. The Snag Hill tower will require construction of approximately 200 feet of access road (USFS 1990b).

2.2.1.1 Site Geology and Ore Characteristics

Hayden Hill is a shallow epithermal gold and silver deposit associated with Late Miocene subaerial hot spring activity. Complexly faulted and intensely altered Tertiary volcanic and sedimentary rocks host the ore. The main mineralization event was preceded by the development of a broadly flat-lying bedded zone of intense silicification. Gold and silver were subsequently deposited in quartz adularia veins, stockworks, and breccias in open spaces provided by fracturing of the silicified zone.

Two distinct mineralized zones at Hayden Hill include the Lookout zone, which extends north-south across the summit of Hayden Hill, and the Providence zone, which is approximately 1,000 feet southwest of the Lookout zone. The Lookout zone contains ore which occurs as zones of quartz veins, stockworks and hydrothermal breccias. Together, these features form a grossly tabular ore zone 1,800 feet long, 800 feet wide, and 600 feet thick. A series of banded quartz adularia veins crosscut the tabular ore zone.

These veins form discrete zones up to 100 feet thick and contain higher grade ore. Mill-grade ore (>0.035 ounces per ton [opt] Au) forms a funnel-shaped "central feeder" zone within the main Lookout zone which is enclosed by the larger body leach-grade ore.

Mineralization in the Providence zone consists of several narrow, steeply dipping, structurally controlled ore zones. Gold and silver occur in sets of veins, forming zones up to 12 feet thick in lithic breccia, and in irregular zones of stockwork veining up to 50 feet thick in sedimentary rocks.

Approximately two-thirds of the Lookout zone and nearly all of the Providence zone have undergone deep surficial oxidation. Oxidation is enhanced along fractures and down porous quartz veins, but areas of unoxidized or partially oxidized ore remain in the upper reaches of the oxidized zone.

A description of the site geology, ore characteristics and geotechnical information from the heap leach, tailings impoundment and waste rock dump site investigations are presented in Chapter 3.0.

2.2.1.2 Erosion and Sediment Control

Erosion and sediment control as well as the Project drainage requirements are presented in Sections 4.4.3 and 4.4.4 of the Reclamation Plan (Appendix E).

2.2.2 Mining Operation

Based on current knowledge of the deposit, the Hayden Hill Project will utilize conventional open pit mining methods to extract ore, overburden, and waste. A total of 131.0 million tons of material will be removed from the pit over the life of the mine. This total includes 9.6 million tons of mill grade material, 35.7 million tons of heap leach material and 85.7 million tons of waste material. Annual production will total 17.5 million tons with a waste rock to ore ratio of 1.9 to 1.

The proposed mining and mineral processing operation will directly impact approximately 950 acres. Table 2.2-1 summarizes the projected amount of surface disturbance due to each Project activity.

2.2.2.1 Open Pit

The configuration of the ore zones at Hayden Hill will result in the mining of two zones within one open pit; the Lookout zone which trends north-south across the top of Hayden Hill and the Providence zone approximately 1,000 feet southwest of the Lookout zone (see Figure 2.2-1). The excavation on the Lookout zone will include approximately 8.99 million tons (mt) of mill ore, 33.33 mt of heap leach ore, and 75.79 mt of waste rock. It will extend approximately 2,725 feet in a north-northeast direction, and 2,080 feet at its widest point in a west-northwest direction. The excavation on the Providence zone will include approximately 0.60 mt of mill ore, 2.38 mt of heap leach ore, and 9.92 mt of waste rock. It extends approximately 2,100 feet in a north-south direction, and 1,080 feet at its widest point in an east-west direction.

Over the life of the mine the pit zones may merge or enlarge, depending on the economic environment. Table 2.2-2 summarizes the dimensions of the Lookout and Providence zones, and the ore and waste rock volume of the pit.

The pit has been designed to surface mining industry standards, with 45-degree pit slopes and 20-foot high benches, to allow sufficient mining selectivity and to be compatible with drills and loading units. The pit slope and bench height may vary due to on-site rock mechanic testing, performed concurrently with actual operations, to ensure continued maximum pit stability and safety. The pit limits were defined using only proven ore material. Probable and possible material were considered waste but may prove to be ore during the course of the mining operation which may enlarge the size of the pit.

Mining will occur in three stages. The first stage will entail pre-production stripping; commercial timber harvesting; and removing and stockpiling useable growth media from the mine and waste rock dump areas. In the second stage, overburden will be removed by front-end loaders and hauled by trucks to the waste rock dump northwest of the pit. Some of this material may be used for construction of tailings impoundment embankments. Approximately 2 to 3 million tons of overburden will be removed during this stage. In the third stage of mining, ore will be mined by open-pit mining methods which include drilling, blasting, and loading processes. Blasting procedures are discussed in detail in Section 2.2.2.4. Ore will be loaded by front-end loaders into 85 ton haul trucks and transported to the ore preparation facility. Waste rock will be transported to the waste rock dump by truck (Figure 2.2-1). The second and third stages may be concurrent.

Mining will be split into two phases to spread the pre-production stripping evenly throughout the life of the mine as follows. Areas will be mined sequentially. Phase I of the Lookout zone will be mined concurrently with the Providence zone; Phase II of the Lookout zone will be mined last. Mine access will change throughout the life of the mine. Initial operations will be on the top of Hayden Hill, mining Phase I of the Lookout zone. Access to the crusher will also change as mining progresses and the pit forms.

The target production rate is approximately 6 million tons of ore per year. Daily production will be approximately 60,000 combined tons of ore and waste rock per day. The proposed mining schedule will involve two 10-hour shifts per day, operating six days per week. At this mining rate, mining activities will last for approximately 8 years. Table 2.2-3 summarizes the operating schedule at the Project.

TABLE 2.2-1

SUMMARY OF DISTURBANCES
HAYDEN HILL

Component	Acres	General Location
Pit (Includes Lookout and Providence Zones)	176	Sections 1, 31, 36
Waste Rock Dump (Includes auxiliary facilities)	206	Sections 31, 36
Growth Media Stockpile	22	Sections 31, 36
Mill/Crusher Process Complex (Including office/shop facilities)	68	Sections 1, 36
Tailings Impoundment	131	Section 1, 36
Heap Leach Pad	199	Section 1
Ponds (Pregnant Ponds 1, 2, 3, process water, detention)	23	Section 1, 36
Administration Building	2	Section 36
Roads, Pipelines, Fence Lines, Power Lines, Miscellaneous	123	Throughout
TOTAL (over mine life)	950	

Note: Located partially or totally on:

SEC1, T36N R9E
SEC6, T36N R10E
SEC31, T37N R10E
SEC36, T37N R9E
SEC25, T37N R9E

Note: The disturbances along Highway 139 to Adin due to the power corridor which are outside the immediate site boundary, will be very minor at specific pole locations and are not included in this table. Disturbances as a result of the power line within the site boundary are included in this table.

TABLE 2.2-2

CHARACTERISTICS OF THE LOOKOUT AND PROVIDENCE ZONES
(Tonnages Provided by the Applicant)

	Lookout Zone	Providence Zone
Dimensions		
Depth (feet from surface)	700	380
Length (feet)	2,725	2,100
Width (feet)	2,080	1,080
Surface Area (acres)	128	48
Density of Ore and Overburden (in-situ) (tons/cubic yard)	1.92	1.92
Ore Volume (tons)	42,322,000	2,983,000
Overburden Volume (tons)	75,788,300	9,917,000
Total Pit Volume (tons)	118,110,300	12,900,000

TABLE 2.2-3

OPERATING SCHEDULE FOR THE HAYDEN HILL PROJECT

Mining Activity	Hours/Day	Days/Week	Days/Year
Mining	20	6	302
Ore Preparation (Crushing)	20	7	365
Prepared Ore Transport	20	6 - Leach	302
	20	7 - Mill	365
Heap Leaching	24	7	365
Milling	24	7	365
Gold Recovery			
Carbon Adsorption	24	7	365
Carbon Desorption	24	7	365
Refinery	10	7	365

The zones will be connected by a slot cut between the two zones. The slot will facilitate access between the zones and reduce overall haul road disturbance.

2.2.2.2 Plant Growth Media Removal and Storage

Prior to soil salvage, timber will be harvested and large shrubs will be removed from the site. Big sagebrush and Juniper trees will be removed and segregated to reduce potential allelopathic effects. The remaining vegetation will be removed and stored with the growth media to increase the organic matter content of the growth media which was found to be low (<4%) in baseline studies (Bio-Resources, 1990a). Vegetation located at the waste rock area will be removed incrementally to control surface erosion.

Most of the soils occurring on the site are shallow to bedrock, and rocky. With the exception of the growth media stockpile areas, minor roads, and drill pads, where the growth media will be left in place, growth media salvaging on site will take place in all disturbed areas containing suitable reclamation growth media. Baseline soils mapping of the site has been completed (see Section 3.3). Site by site suitability of the soils will be determined by the Mitigation Compliance Coordinator (MCC). See Appendix D for a description of the MCC's responsibilities. Since the area of the initial pit on Hayden Hill is composed primarily of rock outcrops, the very small, isolated pockets of soil material will not be salvaged at that site. However, larger pockets of growth media material will be salvaged. The lower reaches of the pit, waste rock dump, crusher/mill/plant site areas, tailings impoundment, and the leach pad site contain salvageable growth media material which will be stripped and stockpiled.

Efforts will be made to salvage, at a minimum, the O and A horizons of soil material. The O horizon is the uppermost soil layer and is composed of slightly decomposed organic materials. It contains a high percentage of the microbial constituents found in soils which have been determined to be beneficial to plant life. At Hayden Hill the O soil horizon will also be salvaged due to the low organic matter content of the soils at the site. The A horizon is the uppermost zone from which soluble salts and colloids have been leached and in which fully decomposed organic matter has accumulated. In those areas where the A horizon is shallow or indiscernible, suitable B horizon material will also be stripped and stockpiled. The B horizon is the layer in which material leached from the overlying A horizon is accumulated. It usually contains very little organic matter and is lower in microbial activity than the O and A horizons. However, due to the low organic matter content of the A horizon at this site, the A and B horizons do not differ substantially. For these reasons the B horizon material will not be stockpiled separately from the O and A horizon soils.

However, the soils do differ substantially in the seed banks they contain. Since the indigenous vegetation is adapted to the specific soil and the soil contains seeds and a microbiological ecology adapted to the vegetation type, the soils from Jeffrey Pine/Mountain Shrub, Upland Shrub, and Low Sagebrush vegetated zones will be stockpiled separately. In addition, disturbed wetland soils, will be stockpiled separately and used in wetland revegetation.

The goal at Hayden Hill is to salvage enough soil material to provide a 12-inch soil cover on disturbed sites prior to seeding. Studies completed to date indicate that the salvageable growth media on site will be sufficient to cover all excavated areas for reclamation with a 12-inch soil cover (Section 4.2.3). A minimum of 1,298,700 cubic yards of growth media will be salvaged and stockpiled. For more detail on growth media quantities, see Section 4.2.3.

Growth media stripping will be performed using dozers, scrapers, trucks, and loaders. Stripping operations will proceed concurrently with various mining operations over the life of the Project. However, in order to minimize compaction and enhance the stability of the growth media stockpiles, whenever possible, growth media will be handled during the drier parts of the year.

Following stripping, suitable growth media will be salvaged and stockpiled in one of the three areas shown on Figure 2.2-1. These locations were chosen to minimize haul distances and to limit exposure to wind and water erosion. The soil will be stockpiled as much as practicable in a low, broad fashion to reduce compaction and loss of microbial activity. The stockpiles will be contoured, with side slopes averaging 3H:1V, to minimize erosion and compaction and to permit rapid establishment of protective vegetative cover. Ditching will be constructed around the stockpiles to minimize run-on erosion. Growth media stockpiles will be protected from livestock grazing by fencing. To further stabilize the growth media stockpiles, minimize erosion and maintain biological viability, the stockpiles will be seeded with the Interim Seed Mix as recommended by the Soil Conservation Service (SCS). The Interim Seed Mix is discussed further in Section 4.4.9 of the Reclamation Plan. The interim vegetation cover established on the growth media stockpiles will further reduce soil erosion while providing micro-habitats for beneficial soil organisms.

2.2.2.3 Waste Rock Dump

The Project will involve the mining and disposal of approximately 85.7 million tons of waste rock. Waste rock includes non-mineralized and slightly mineralized material overlying and interspersed within the ore. The bulk of the waste rock will be located north-northwest of the pit as shown on Figure 2.2-1. The waste rock dump ranges from 5,400 to 6,150 feet in elevation and will cover approximately 206 acres, depending on mitigation, reclamation and safety requirements.

The dump will be constructed in layers or terraces, starting at the top. Successive terraces will be placed down hill 100 feet below and to the front of the previous dump. The initial dump crest will be at an elevation of 6,150 feet. The lowest crest elevation will be 5,750 feet.

The terraces will form benches with each terrace or bench face at the natural angle of repose, 1.3H:1V. A cross-section of the waste rock dump is shown on Figure 2.2-2. The face of each terrace will be formed by end dumping over the active dump face. Overall, the waste rock dump will have a final slope of 3H:1V. By utilizing the terraced approach with angle of repose on the last terrace, a total surface area of 206 acres will be disturbed.

The waste rock dump will be composed primarily of competent, silicified, volcanic rocks and lower-strength, clay-altered, volcanic rocks. A 30 percent swell factor from the in place bank volume to the loose bulk volume is assumed in the conceptual design.

The results of a geochemical evaluation of the waste rock materials are presented in the January 10, 1990, report titled "Waste Classification Report" by Denver Knight Piesold (DKP) (DKP 1990a). Test results for the waste material from both pits indicate the following:

- CAMWET and bioassay testing (California Administrative Code [CAC] Title 22, Chapter 30, Subtitle 11) indicates that the waste rock materials tested are non-hazardous and nontoxic.

- Acid-base accounting test results on a limited number of samples indicate some potential for acid rock drainage (ARD) although the average total sulfur values are relatively low.

- Kinetic acid generation tests on selected composites of the waste show minimal potential for the development of an acid leachate.

The DKP (DKP 1990a) report concludes that the waste rock materials are nontoxic to aquatic life, with low acid generation potential and should be classified as a Group C waste as defined in Title 22, Chapter 30, of the California Hazardous Waste Management Regulation. On the basis of the DKP recommendation, the waste rock facility design contains no provisions for a lining and leachate collection system. This is in conformance with the regulatory requirements for waste management units to contain Class C wastes as defined in Title 23, Chapter 3, Subchapter 15, of the California Water Regulations. The Applicant proposes to monitor the waste as it is produced to evaluate its conformance to a Class C classification. The monitoring procedures are outlined in the Geochemical Sampling and Contingency Plan (GSCP) (Appendix M). Surface water run-off will be controlled by diversion ditches designed and constructed to contain the run-off from a 1,000-year, 24-hour storm event.

2.2.2.4 Drilling, Blasting and Loading Procedures

Blasting will be required to mine the ore body. Blastholes, 6-3/4 inches in diameter, will be drilled with either rotary or percussion drills. Blasthole configurations will maximize fracturing and grade control.

Production blasting will utilize ammonium nitrate and fuel oil (ANFO) blasting agents, and cap sensitive primers.

After blasting, production ore will be separated from waste rock. Waste rock will be hauled to the waste rock dump and ore will be hauled to the crushing facility.

Table 2.2-4 lists the types of fuels, reagents, and blasting agents for the Project along with estimated annual consumption rates and delivery and storage information. Transportation of all reagents and fuels will be provided by independent vendors licensed and experienced in the State of California. Section 1.5.1 in Chapter 1.0 identifies the proposed transportation route.

Storage and use of these materials will meet all pertinent Federal, State, and County regulations. Blasting agents will be stored in compliance with applicable Bureau of Alcohol Tobacco and Firearms (BATF) and Mine Safety and Health Administration (MSHA) regulations. The Project will comply with California Proposition 65 relative to materials handled on the site. Blasting will be conducted in accordance with applicable regulations for airblast and vibration monitoring.

Blasting will be performed daily and be limited to daylight hours. The blasts will be monitored by licensed blasters. Vehicular traffic on adjacent roads will be halted during blasting. Safe seismic disturbance and air blast limits will be established to prevent damage to the buildings within the Project site boundary. Although no problems are anticipated due to the blasting, corrective action will be implemented should problems arise.

2.2.2.5 Mining Equipment Requirements

Mining will utilize a truck/loader operation. A preliminary list of mining equipment is shown on Table 2.2-5. This equipment list may be revised during the life of the mine to suit actual operational conditions. Mining equipment will be fitted with original equipment mufflers, spark arrestors, and engine enclosures to reduce noise and fire potential. Equipment will be maintained on a regular, scheduled basis.

2.2.3 Ore Processing Facilities

The ore processing facilities are located on the relatively flat area south of the open pit (Figure 2.2-1). The facilities will include an ore preparation area with crushing equipment, an ore stockpile area, heap leach pad, mill, solution containment ponds, tailings impoundment, and metals recovery system (Figures 2.2-3A and 2.2-3B). These facilities are described in detail in the following sections.

TABLE 2.2-4

REAGENTS, FUELS, AND BLASTING AGENTS

Area	Item	Estimated Annual Consumption	Delivery/Storage
Mine	ANFO	3,500 tons	Delivered: bulk, 35 ton truckload. Stored: 100 ton bins.
Crusher Mill	Lime	15,000 tons	Delivered: bulk, 35 ton truckload. Stored: (2) 75 ton bin at Mill, (1) 150 ton bin at crusher.
Crusher	[2]Cement	20,000 tons	Delivered: bulk, 35 ton truckload. Stored: 150 ton bin.
Process	[1]Sodium Cyanide	2,500 to 3,000 tons	Delivered: 42 ton truckload. Stored: outdoors on lined pad. 20% solution in two 25,000 gallon tanks.
Process	Antiscalant	200 tons	Delivered: truck, 5,000-gallon tanker. Stored: 3,500-gallon tanks near ponds and at mill site.
Process	Caustic Soda (50% NaOH)	500 tons	Delivered: Truck, 5,000-gallon tanker. Diluted to 20%. Stored: 18,000-gallon tank at mill.
Process	Hydrochloric Acid	275 tons	Delivered: truck 5,000-gallon tanker. Stored: 6,000-gallon tank at mill.
Process	Carbon	64 tons	Delivered: truck, 1,000-pound sacks. Stored: outside storage area.
Process	Zinc	60 pounds	Delivered: 60-pound cans on pallets Stored: In warehouse
Process	Flocculent	38 tons	Delivered: truck, 5,000-gallon tanker. Stored: 2,000 pound flo-bins.
General	Propane	617,000 gallons	Delivered: truck, bulk, liquified. Stored: Various 1,000-10,000 gallon tanks.
General	Diesel Fuel	2.6 mil gallons	Delivered: 6,000-gallon tankers. Stored: 4 above ground, bermed 8,000-gallon tanks on concrete pad.
General	Gasoline	115,500 gallons	Delivered in 6,000-gallon tankers. Stored: 1 above ground, bermed 10,000-gallon tank on concrete pad.

[1] Sodium cyanide will be transported to the site in dry bulk as briquettes or other bulk system. Transportation will be arranged and controlled by the supplier per applicable transportation standards.

[2] Cement will be stored only if agglomeration of heap ore is required.

TABLE 2.2-5

ESTIMATED EQUIPMENT REQUIREMENTS FOR THE HAYDEN HILL PROJECT

Equipment Type	Estimated Quantity On-Site
Bulldozer, 700-horsepower	2
Loader, 13-yard	3
Haul Truck, 85-ton	10
Rotary Drill, 6-3/4-inch	3
Grader, 16-foot & 14-foot Blade	2
Skid-Steer Loader	1
Backhoe	1
Hydraulic Crane, 45-ton	1
Truck Cranes, 4-ton & 90-ton	2
Forklifts, 3-ton & 6.5-ton	2
Water Truck, 9,000-gallon	2
Service Vehicles	5
Utility Vehicles	25
Vans, 15-Passenger	9
Mine Rescue Vehicle	1
Tractor (Reclamation)	1
Hydroseeder (Reclamation)	1

As described in Section 2.2.1.1, the ore bodies at the Hayden Hill Project vary in lithology and mineralogy. The treatment of the ore, therefore, varies with ore type. In general, lower grade ore will undergo heap leaching, while higher grade ore will be milled. Heap leach processing solutions and mill processing solutions will converge at the gold recovery stage (Figures 2.2-4A, 2.2-4B, and 2.2-4C).

2.2.3.1 Crushing Facilities

The crushing plant will be a three-stage circuit system designed to operate at an average rate of 1,200 tons per hour at a 3/4-inch product size. The crushing plant will operate up to seven days per week, 52 weeks per year, and it will process both mill-grade and heap leach-grade ore.

The crushing plant area is located between the southwest edge of the Providence zone and the north end of the tailings and heap leach pad at an elevation of approximately 5,800 feet (Figure 2.2-1). The crushing plant will cover approximately 10 acres, and is located at the southeast end of the mill area (Figures 2.2-3A and 2.2-3B). The crushers will be located within enclosures to limit noise and contain dust.

Coarse ore from the pit will be transported by 85 ton haul trucks to the coarse ore storage area (Figure 2.2-3A) where it will be either direct dumped or loader fed into a hopper and feed system. A gyratory crusher will crush the ore to 6 inches. The ore will be transported by conveyor from the gyratory to two double deck vibrating screens to be separated into two size fractions. Screen undersize material (3/4 inch) will be routed to the final crusher product conveyor with oversize material routed to two 7-foot standard cone crushers. Crusher product will be conveyed and separated to two tertiary screens. Tertiary screen undersize material (3/4 inch) will be routed to the final product conveyor with screen oversize material going to two 7-foot shorthead cone crushers. The shorthead cone crushers will be in closed circuit with the tertiary screens.

Based upon grade, crushed ore from the product conveyor will either be conveyed to the fine ore stockpile for mill feed (higher grade ore), or to the heap leach facilities. Lime from a 150 ton storage silo will be added to ore destined for the heap leach circuit to maintain the proper pH levels for leaching. An agglomeration system may also be used if needed.

Surface water flow will be controlled by diversion ditches. The ditches will be designed and constructed to collect and divert run-off from a 1,000-year, 24-hour storm event.

Dust will be controlled during crushing plant operations (dumping, crushing, screening, and transfer points) by a dust suppression system. A baghouse dust collection system may also be used to meet air quality operating permit stipulations and health standards.

2.2.3.2 Heap Leach Facilities Design

The heap leach facility is designed as a zero discharge or closed system. Discharge of process fluids to either surface or groundwaters will be prevented by utilizing properly sized, constructed and lined pads and ponds. The rationale of a zero discharge system is to:

1. Produce an environmentally safe system to protect surface and groundwater resources.
2. Comply with California regulations requiring zero discharge.
3. Maximize recovery of the solutions bearing precious metals.

The heap leach facilities were designed by Knight and Piesold Ltd. (KP). Full details of the heap leach facilities design are found in the July, 1990, KP design report (KP 1990b).

In addition to the zero-discharge design, other environmental protection measures included in the design are enclosed solution ditches (no open solutions exposed) and lined, netted and fenced ponds to protect wildlife. Heap leach-grade ore will be transported from the ore load-out station to the leach pad by standard conveying methods. The heap leach processing technology to be utilized at the Hayden Hill Project is described below.

Heap Leach Processing Technology
Heap leaching is a technique designed to recover precious metals from low-grade ores that could not be recovered economically using conventional milling techniques. The heap leach technology to be used at Hayden Hill is well understood and is widely used and accepted by the industry. Heap leaching is safely and successfully used by mining operations in a variety of environmental and geographic settings throughout the world including the United States, Canada, Australia, and New Zealand. As of January, 1990, there were 8 active cyanide heap leaching and milling operations on Federal land in California, and more than 105 such operations in Nevada (U.S. GAO 1991). Figures 2.2-4A and 2.2-4B show a schematic diagram of the heap leach process.

The process starts by placing ore on the gently sloping lined heap leach pad. A network of pipes with solution spray or drip applicators is placed on top of the ore. The ore will be evenly placed by conveyor, which results in a heap with higher infiltration rates than equipment placed ore. The potential for ponding is thereby minimized. Application rates will be adjusted to eliminate any ponding. Leaching of the ore starts when dilute alkaline (high pH) sodium cyanide solution from the barren (metal free) pond is pumped onto the heaped ore. The sodium cyanide in the solution dissolves the gold and silver in the ore. An alkaline solution is used to prevent the formation of hydrogen cyanide.

The leach solution trickles down through the heaped ore dissolving the precious metals, and certain base metals from the ore. The metal bearing or pregnant solution is collected from the bottom of the heap through the collection pipe network on top of the inner liner. The pregnant solution then flows by gravity to the pregnant solution ponds.

Gold and silver are recovered from the pregnant solution by pumping the solution through tanks filled with activated carbon. The carbon adsorbs the precious metals leaving a barren solution. The barren solution flows by gravity to the barren pond where the solution chemistry is adjusted and the solution is recycled to the heaps. The carbon, which has adsorbed the precious metal, is periodically moved to a stripping circuit. The gold and silver are stripped from the carbon by pumping a pressurized hot caustic cyanide solution through the carbon. The hot solution solubilizes the precious metals which are then precipitated with zinc dust. The precipitate is removed from the solution by a filter. The precipitate is heated in a retort to distill and recover mercury, a by product, and then refined in a furnace to produce doré bars. The stripped carbon is reused in the adsorption tanks.

Heap Leach Pad Design

The leach pad at Hayden Hill, including associated haul roads, pumping and electrical facilities, ponds, and fences, will cover approximately 230 acres. The pad will have a capacity of 35.7 million tons at a height of 120 feet. A profile of the proposed heap is presented in Figure 2.2-4D. The site is located south of and adjacent to the southern end of the Providence zone, next to the crushing facility, and ranges in elevation from approximately 5,600 to 5,800 feet (Figure 2.2-1). Leaching will continue 24 hours per day, 365 days per year.

The heap will be built on a continuous synthetic liner on a prepared foundation. Construction of the pad will occur in phases, and in accordance with requirements of the California Central Valley Regional Water Quality Control Board (CRWQCB). Specifications for the Hayden Hill Project are based on site-specific characteristics described in Chapter 3.0.

The pad will be rectangular in shape. Pad drainage will be engineered for gravity flow of pregnant solutions from the heap to the solution collection structure and then to the pregnant pond. The pad area will be segregated from the surrounding area by diversion ditches designed to bypass run-off flows resulting from a 1,000-year, 24-hour storm event (Figures 2.2-3A and 2.2-4E).

The heap leach pad has been designed to minimize the potential for solution leakage and provide for the detection and extraction of fugitive solution by using double synthetic pad liners and a leachate collection and recovery system (LCRS).

The inner pad liner will be made of 80-mil high density polyethylene (HDPE) and the outer liner will be made of 60-mil HDPE. Between the two liners will be an HDPE drainage net for leak detection and recovery. The pad is divided into cells in order to monitor process solution flows and detect leaks in the various pad areas. The drainage grid for each cell is connected to a 4-inch diameter HDPE pipe which daylights in the pad solution pipe ditch. Leakage flow can be detected and monitored by the LCRS. The pad solution pipe ditch is an extension of the pad double liner and LCRS. All the solution distribution and collection pipes will be installed in the ditch. The ditch is sized to direct all the pregnant solution flow to the pregnant pond should the collector pipe fail or a storm event exceed the capacity of the collector line.

All construction will be monitored and inspected by a California registered Professional Engineer. The liners will form continuous membranes extending across the entire pad surface and tying into perimeter berms. A minimum 36-inch thick layer of crushed ore will serve as protective cover material to shield the synthetic liner from puncture during ore loading. Following installation of the liner protection material, the ore will be loaded onto the pads. Crushed ore for the heap leach will be transported and loaded on the pad via conveyors. The ore will be placed in 8- to 20-foot lifts. The top of the heap will be relatively flat for installation of the solution application system. Ore will be placed on the pad at the angle of repose, which is estimated to produce slopes of 1.5H:1V. The lifts will be constructed to establish 2H:1V overall side slopes.

The pad will be constructed in three phases in adjoining areas (KP 1990b). The first phase of the leach pad will be placed into operation when Phase I construction is completed. Phase II will be built two years after Phase I. Phase III will be constructed five years after Phase I. During each phase, the leached ore will remain on the pad. Successive 20-foot lifts will be placed on the leached ore, one lift at a time, until the heap reaches a height near 120 feet (Figure 2.2-4D). Each new lift of ore will then be leached for approximately 30 to 90 days using sprays in conjunction with a network of drip tube emitters placed on top of the heap. This will continue until each phase is complete. An advantage of this system is that residual gold and silver will continue to be leached from the lower lifts while the upper lifts are being leached. The pad will therefore remain under continuous leach until the solution grade drops to a level which is no longer economic. The heap will then be neutralized, using the procedures described in Section 2.2.11 of this document.

Solution which has percolated through the ore will be collected and drained to the pregnant solution pond (Figures 2.2-1 and 2.2-4E), and then be pumped to the processing facility at the mill site at a rate of 2,000 gallons per minute (gpm). Precious metals will be removed from solution using the processing techniques described in Section 2.2.3.4. Barren solutions will be returned to the barren solution pond where make up water and additional reagents will be added as necessary prior to recycling to the leach pad.

Solution Collection System and Containment Ponds

Pregnant solution at the bottom of the heap will first be collected in 6-inch diameter slotted corrugated polyethylene pipe (CPE) laterals spaced on 50-foot centers above the 80-mil liner. The 6-inch laterals drain to a 15-inch diameter slotted CPE collection pipe embedded in gravel in the divider berm for each cell. The gravel bed will be capable of draining the cell should the 15-inch pipe be blocked.

The 15-inch collector pipe for each cell discharges into a 12-inch Parshall flume with overflow for cell flow monitoring. The flumes discharge into an 18-inch diameter HDPE collection pipe. The 18-inch pipe directs the flow from all cells to the pregnant pond. The 18-inch pipe is located in the lined solution pipe ditch.

The pregnant solution pond for stage I will be located west of the leach pad (Figure 2.2-1). The pond is designed to hold a total of 35 acre-feet of solution. The total includes the operational storage volume of 10 acre-feet and 25 acre-feet of storm water storage for the 1,000-year, 24-hour storm of 4.31 inches. Subsequent pad expansions will require the installation of additional ponds for storm water storage. The pond pumps will be on the emergency power system so that pumping will not be stopped for long periods.

The barren pond located south of the mill (Figure 2.2-1) will have a total volume of 9.2 acre-feet. The pond will have an operational volume of 6.1 acre-feet and a volume of 3.1 acre-feet for emergency spill containment for the mill process area. The pond will have an emergency spillway connected to the lined solution pipe ditch.

The pregnant and barren ponds are to be double lined using 60-mil HDPE. The liners will be separated by an HDPE drainage net which will form the LCRS. Both ponds will be fenced (chain link or equivalent) and covered with netting (1 inch mesh) to exclude wildlife. All solution flows will be in lined ditches within enclosed pipes. Solutions will not be accessible to wildlife.

Leach Solution Application System

The application of the leach solution will be performed using drip emitters and/or spray wobblers. The use of one of these systems, without the option of the other, will not allow sufficient operational flexibility to apply the leach solution in an environmentally safe and efficient manner during varying climatic conditions. The following discussion highlights the merits and faults of each system.

Drip emitters may reduce the total consumption of water over the life of the Project by reducing evaporation. This would only be true during the arid months. The aquifer studies completed at the site indicate the water usage, at the proposed rate, would not cause significant drawdown of the aquifer. Therefore, spray versus drip, from a water usage point of view, becomes an economical decision rather than an environmental decision.

Drip emitters may reduce the total amount of leach reagents consumed over the life of the Project. This is due to cyanide's photo sensitivity and potential to naturally degrade under ultra-violet light. The exact amount of cost savings drip emitters could produce due to this effect is unknown.

Sprays produce drops which can reduce the infiltration rate of the leach solutions by sealing off the top layer of the heap if sufficient clay material is present. This is accomplished by the pounding action of the drops breaking up the softer particles and depositing them among the harder particles to effectively seal the top layer. This reduces the effectiveness of the operation by lowering the recoverable gold extraction percentage. Drip emitters place the solution on the surface where a wicking action draws it into the heap, therefore, sealing is eliminated with drip emitters.

Drip emitters are considered to provide superior distribution, with less ice build up in the winter, over spray wobblers. The application rate can be adjusted more easily and at less cost with drip emitters than sprays. However, drip emitters function through the use of small tubes and orifices which can clog or freeze easily. They are highly sensitive to changes in water chemistry which affect the total dissolved solid content of the solution.

During storm events and periods of excess run-off spray systems allow evaporation to be used to control the volume of water in the process. Drip emitters do not allow this operational flexibility.
Although drip emitters are easier to adjust for rate of flow, they are more difficult and labor intensive to install and maintain than sprinkler systems. Also, the coverage from spray systems is visually apparent while a drip systems coverage is not.

The Applicant recognizes the potential benefits of using a system composed of entirely drip emitters, however, they consider the technology unproven. Maintaining the water balance as designed is critical to the proper operation of the facility. Spray evaporation over the heap is necessary to maintain this balance. The Applicant proposes to use both systems to obtain the benefits of each.

Leach solution will be circulated through HDPE and steel pipe to the heaps from a pump station at the barren pond. The solution will be applied to the heap by a network of drip tube emitters or sprays placed on top of the heap. The solution will be applied at an initial rate of approximately 0.0045 gpm per square foot of heap surface. This rate will be adjusted depending on the permeability of the heap. The barren leach solution will contain approximately 250 to 500 parts per million (ppm) of cyanide.

Reagent consumption and leach solution chemistry are listed in Table 2.2-6. The chemistry of the leach solution will be continually monitored, and fresh water and reagents will be added to the barren pond as needed.

TABLE 2.2-6

REAGENT CONSUMPTION AND LEACH SOLUTION CHEMISTRY

Reagent	Consumption	Solution Chemistry
Sodium Cyanide		
(Heap Leach)	0.75 lb/ton ore	250 ppm
(Mill)	2.0 lbs/ton ore	500 ppm
Lime	5.0 lbs/ton ore	--
pH	--	10-11

Berm Design

The heap leach processing area will be surrounded by an earthen berm (Figures 2.2-3A 2.2-4D and 2.2-4E) or diversion ditch. This structure will prevent any surface run-off from entering the facility and causing erosion of structures or dilution of the pregnant solution. The berm or diversion ditch will also prevent the escape of solutions from the facility in the event of a spill. The interior surface of the berm or ditch will be lined with an extension of the liner.

Spent Heap Leach Ore Characteristics

The results of a geochemical evaluation of the heap leach head ore and spent ore are presented in the January 10, 1990, DKP Waste Classification Report (DKP 1990a) and the August 17, 1990 DKP Report of Waste Discharge (DKP 1990c). The head ore rather than a spent ore product was selected for testing based on the assumption that the run-of-mine ore reasonably represents the post-processing mining waste as it contains the maximum concentration of metals and sulfitic materials.

The test results for the heap leach ore from the Lookout zone indicate the following:

- CAMWET and bioassay testing (CAC Title 22, Chapter 30, Article 11) indicate the heap leach head ore tested is non-hazardous and nontoxic.
- Acid-base accounting test results on a limited number of samples indicate some potential for ARD although the average total sulfur values are relatively low.

The ore to be obtained from the Providence zone also tests as nontoxic and the acid-base accounting tests indicate very little to no potential for ARD.

The DKP report indicates that although the heap leach ore does not classify as hazardous or toxic, the operating heap will contain a dilute solution containing cyanide, a listed toxic substance. Therefore, DKP has recommended that the heap leach facility be classified as Class B during operation. Requirements for Class B facilities are as described in Title 23, Chapter 3, Subchapter 15, of the California Water Regulations.

Upon closure of the heap facilities, the cyanide concentration will be reduced in the heap leach process solution. This solution, with make-up water contributions to compensate for losses to evaporation, will be used to detoxify and neutralize the heap. When the effluent from the heap meets applicable quality standards, the solution will be allowed to evaporate by continued application to the heap.

The DKP report recommends that the detoxified and neutralized heap be classified as a Class C facility and a Group C waste for closure based on compliance with water quality standards as assessed by monitoring effluent quality from the heap. The DKP report also states that there is a slight acid generation potential for the leach feed ore. The low total sulfur content of the ore (about 0.24 percent) and the projected lime addition of 5 pounds per ton indicate that potential for acid generation upon closure is small and should not affect the Class C closure classification. The Applicant proposes to monitor the spent ore as described in the GSCP (Appendix M) to evaluate its conformance to the Class C closure classification.

2.2.3.3 Mill Process Description

The milling and processing facilities will be located as shown on Figure 2.2-3B. The grinding and carbon processing facilities will be housed in a 100-foot by 260-foot metal building. The area containing the process tankage will be adjacent to the building on a concrete pad and surrounded by containment walls.

The mill will grind and process 3,500 tons of ore per day. The mill has been designed to use proven technology and will operate 24-hours per day, 7 days per week, 52 weeks per year.

The mill and associated processes are diagrammed on Figures 2.2-4A, 2.2-4B and 2.2-4C. Ore, which has been crushed to 80 percent passing a 3/4-inch screen, will be conveyed to a water flush cone crusher for further size reduction. The cone crusher will operate in closed circuit with a vibrating screen. The screen undersize material will flow by gravity to ball mill #1 cyclone feed pump sump for pumping to the cyclones.

The cyclones are particle sizing devices. The cyclone underflow will be coarse material which will flow by gravity to ball mill #1 for further grinding. The cyclone overflow will flow by gravity to ball mill #2 cyclone feed sump for pumping to the second set of cyclones. The grinding mills operate in closed circuit with their respective sets of cyclones.

Approximately 25 percent of the discharge from ball mill #2 could be processed in the gravity circuit. The gravity circuit is designed to recover coarse gold using Reichert cones, spirals, a strake, and a shaking table. Gold recovered by the gravity circuit will be refined and cast as doré bars in the refinery.

Lime and cyanide will be added to the grinding circuit to start the leaching of the gold and silver in the ore. Approximately 5 pounds of lime and 2 pounds of sodium cyanide will be used for each ton of ore processed.

The #2 ball mill cyclone overflow is the grinding circuit product and will be a slurry at 20 percent solids. The slurry will contain gold and silver in solution. The cyclone overflow will flow by gravity to the 100-foot diameter pre-leach thickener.

A solution/solids separation is made in the pre-leach thickener. The thickener overflow will be a pregnant solution and will be pumped to the mill carbon columns. The thickener underflow which has been densified to 50 percent solids by weight, will be pumped to the leach circuit for additional leaching.

The leach circuit consists of four 54-foot diameter by 43-foot high agitated steel tanks and will have a total retention time of 48 hours. Additional cyanide and lime can be added to the tanks if needed. Air will be sparged into the tanks to provide oxygen for the leach reaction.

Leached slurry flows by gravity to the carbon-in-pulp (CIP) circuit consisting of six 32.5-foot diameter by 26-foot high agitated steel tanks. Activated carbon is added to the CIP tanks to adsorb the gold and silver from the slurry. Total residence time in the six tanks is 12 hours.

The thickening, leaching, and CIP facilities are designed to contain and control process slurries and solutions. The containment area around the process tankage has been designed to contain spills. It is also designed to direct and drain large spills to the barren pond. The barren pond has been sized to have an emergency spill storage volume of 3.1 acre-feet, which is 110 percent of the pre-leach thickener volume (the largest tank in the facility).

2.2.3.4 Gold Recovery Process Description

The gold recovery facilities will be housed in the mill building (Figures 2.2-3A and 2.2-3B). Gold recovery requires four major processes: 1) adsorption of metal values from the mill and heap leach solutions onto activated carbon; 2) stripping or desorption of metal values from the carbon; 3) precipitation of metal values onto zinc dust; and 4) refining of zinc precipitate to produce doré.

Heap leach and mill pregnant solutions will be pumped through a series of carbon columns, each containing 3 to 4 tons of activated carbon. The gold and silver in solution will be adsorbed by the carbon.

Gold and silver in the leached ore slurry are recovered by adding activated carbon to the CIP circuit adsorption tanks. Barren carbon is added to the last tank and the batch advanced counter currently to slurry flow to progressively load precious metal values.

Loaded carbon from the heap leach and mill carbon columns is combined with CIP circuit loaded carbon in the stripping circuit (Figures 2.2-4A, 2.2-4B and 2.2-4C). The loaded carbon will then be pressure stripped by circulating a hot caustic cyanide solution under pressure through the pressure stripping vessels. Stripped carbon is reactivated and reused.

The pregnant strip solution is pumped to a pressure filter where zinc dust is added to precipitate the gold and silver. Periodically, the precipitate is dumped from the filter. The precipitate is retorted to remove mercury and then refined in a furnace to produce doré bars.

2.2.4 Tailings Disposal

Tailings from the Hayden Hill mill will be deposited in the tailings impoundment at a rate of 3,500 tons per day. Prior to placement, the slurry from the mill will be treated to reduce cyanide levels. The proposed tailings impoundment site lies northwest and adjacent to the heap leach facilities and southwest and adjacent to the mill (Figure 2.2-1). The site was chosen following elimination of 14 alternative sites which are discussed in Section 2.3.3.1. Geotechnical investigations of the tailings impoundment site are briefly summarized in Chapter 3.0. A description of the tailings characteristics and the design of the tailings impoundment follows.

2.2.4.1 Tailings Impoundment Design

The tailings facilities were designed by KP. Full details of the design are found in the KP design report of July 1990 (KP 1990b).

The tailings impoundment is sited southwest of the mill as shown on Figures 2.2-1 and 2.2-5. The impoundment will cover approximately 131 acres and will use subaerial deposition technology. The facility is designed to hold 9.6 million tons of mill tailings deposited at a rate of 3,500 tons per day over the 8 year Project life. The impoundment will be lined and will be a zero discharge facility.

The subaerial deposition method will produce an unsaturated tailings beach with minimum water pond area. Water decanted from the tailings will be recycled to the mill.

The impoundment will be designed and constructed so as not to store more than 15 acre-feet of water. Therefore, the impoundment will not come under the jurisdiction of the California Department of Water Resources, Division of Safety of Dams.

The tailings impoundment and associated process water pond will conform to the storm water storage requirements issued by the California State Water Resource Control Board. The process water pond will be sized for the 1,000-year, 24-hour storm event. Surface run-off will be diverted by ditches away from the facilities.

Key design features of the tailings impoundment are the single geomembrane basin liner, the LCRS and the decant system. The impoundment will be lined with an HDPE liner. A 60-mil liner will be under the expected area of standing water. The remaining liner will be 40-mil. To reduce solution head pressure on the liner beneath the area of standing water, a leachate collection system will be installed on top of the liner. The LCRS will consist of 6-inch slotted CPE pipe and 3-foot wide highway edge drains to route basal waters to the decant system. Basal waters plus the surface decant water will flow into the decant pipe in the southwest corner of the impoundment. Waters will exit the decant system through a 16-inch diameter pipe by gravity to the reclaim sump or process water pond (Figure 2.2-5).

The process water pond will be double lined similar to the heap leach ponds. The pond will have two 60-mil HDPE liners separated by an HDPE drainage grid which forms the LCRS. The pond will have an operational storage volume of 9.2 acre-feet and a storm water volume of 32.8 acre-feet (Figure 2.2-5).

Present knowledge of the mill grade ore and tailings geochemistry indicates that the tailings classify as nonhazardous.

Prior to deposition in the tailings impoundment, the mill tailings cyanide level will be reduced to a level meeting CRWQCB standards and non-toxic to wildlife. The cyanide level will be reduced by washing the tails with fresh water in the tailings wash thickener and by a chemical detoxification process. The chemical detoxification will be either INCO SO_2, alkaline chlorination or another demonstrated acceptable process. Natural degradation within the impoundment by ultraviolet light and oxidation will further reduce solution cyanide levels.

Since the mill tailings will be detoxified, no bird netting is proposed for the tailings facilities. Fencing will, however, be installed to prevent animals from entering the facilities.

2.2.4.2 Tailings Characteristics

Mill tailings are a mineral benefication waste containing some residual cyanide from the processing circuit. While most of the cyanide will be recovered in supernatant solutions, concentrations of less than 10 ppm are anticipated to remain entrained in the consolidated tailings interstitial spaces.

During placement, slurry is placed over previously placed tailings to effect a thin layer deposition. Supernatant solution drains from the tailings and is reclaimed, while the solids consolidate. The results of a geochemical evaluation of the tailings head ore and tailings supernatant solution are presented in the January 10, 1990, DKP waste classification report (DKP 1990a).

The head ore, rather than a tailings product, was selected for waste classification, toxicity, and ARD testing based on the assumption that the run-of-mine ore reasonably represents the post-processing mining waste as it contains the maximum concentration of metals and sulfitic materials. Tailings supernatant solution from pilot metallurgical work was also tested.

Test results for the ore to be milled from both pit zones follow:

- CAMWET and bioassay testing (CAC Title 22, Chapter 30, Article 11) indicate the tailings head ore and tailings supernatant are non-hazardous and nontoxic.
- Acid-base accounting test results indicate a potential for ARD although the average total sulfur values are relatively low.

Tailings products from the Lookout Pit were recently formed using both the SO_2 and the Cl_2 detoxification methods, (White 1991). A summary of the results, based on a personal communication, follows.

- Bioassay, Total Threshold Limit Concentration (TTLC) and Soluble Threshold Limit Concentration (STLC) testing (CAC Title 22, Chapter 30, Article 11) indicate the head ores are nonhazardous and nontoxic;
- The TTLC and STLC testing indicate both the lower and higher-grade tailings products formed using either the SO_2 or the Cl_2 detoxification method are nonhazardous and nontoxic;
- Static acid-base accounting test results for the head ore samples showed some potential for ARD. However, the average total sulfur values are low; and
- Static acid-base accounting test results indicate both detoxification methods decrease the potential for ARD compared with head ore samples. The SO_2 method appears to generate a higher net neutralization potential than the Cl_2 method. Pre-production humidity cell tests for the detoxified lower grade and higher grade tailings products are complete and to date have shown no acid generation with either treatment.

The DKP report indicates that although the head ore does not classify as hazardous or toxic, the mill tailings will include low concentrations of cyanide which is a listed toxic substance. Therefore, although the tailings disposal facility is designed to maximize collection of supernatant solution through the use of a decant and subdrains, DKP has recommended that the mill tailings be classified as a Group B waste during operation as defined in Title 22, Chapter 30, of the California Hazardous Waste Management Regulations. Group B waste classification implies the need for a Class B disposal facility as defined in Title 23, Chapter 3, Subchapter 15, of the California Water Regulations.

Denver Knight Piesold has indicated that the supernatant solution should not be classified as a mining waste because it is recycled in the benefication process. Prior to permanent closure the cyanide and pH levels of free supernatant solution will be reduced to permitted levels and the residual solution will be allowed to evaporate.

Denver Knight Piesold has indicated that residual cyanide concentrations in the tailings will reduce with time. Precipitation, which infiltrates the closed facility, will also act to further reduce entrained concentrations by flushing interstitial solution into the leachate collection system.

The DKP report recommends that the tailings management facility and enclosed wastes be classified as Group C for closure based on compliance with water quality standards as assessed by monitoring residual cyanide concentrations in solutions draining from the tailings prior to and during closure. The DKP report also states there is an acid generation potential for the mill tailings. The low total sulfur content of the ore and projected lime usage in the mill indicate the potential for acid generation upon closure is alleviated and should not affect the Class C closure classification. The Applicant proposes to monitor the tailings to evaluate the conformance to these group waste classifications.

2.2.5 Hydrologic Design Criteria and Diversion System

The Hayden Hill Project facilities, including the open pit, waste rock dump, and processing facilities, will be protected from surface run-off with a system of diversion ditches and rock berms. These have been designed using hydrologic data described below.

Data on precipitation and evaporation were collected from weather stations near the Hayden Hill Project area (Table 2.2-7). These data were evaluated to determine the maximum amount of precipitation which could fall onto the heaps and ponds and the resulting maximum run-off that could flow from the heaps and tailings into the ponds. Further information is presented in the "Report of Waste Discharge" CRWQCB permit application (DKP 1990c). Based upon these data, the pregnant and tailings process water ponds were designed to accommodate run-off resulting from the 1,000-year, 24-hour storm event (4.31 inches of precipitation). Emergency generators will run the pond pumps during power outages.

The leach pad, tailings impoundment, ponds, and processing facilities are also protected from surface run-off by engineered diversion channels. This diversion system will route spring snowmelt and uncontaminated surface run-off to natural drainage channels and sediment ponds. The diversion ditches will consist of channels and ditches sized to accommodate precipitation and run-off of the design storm event. The storm intensity utilized in designing the run-off diversion channels was a 1,000-year, 24-hour event.

TABLE 2.2-7

HAYDEN HILL PROJECT
REGIONAL EVAPORATION RECORDS
(INFORMATION FROM KP, JULY 1990)
(EVAPORATION IN INCHES)

Station	Lookout 25	Fall River Mills 4NW	Pit River PHI	Alturas	Pittville IS	Eagle Lake	Maximum	Minimum	Mean
Stat. No.	A12 509401	A10 296403	A10 694400	A10 0161102	A10 695201	G30 259201			
Elevation	?	3340'	1458'	4450'	?	5130'			
Month									
January	0.87	1.06	*	0.83	*	*	1.06	0.83	0.92
February	1.22	1.54	*	1.38	*	*	1.54	1.22	1.38
March	2.56	3.82	*	2.80	*	*	3.82	2.56	3.06
April	4.61	5.28	*	4.72	*	*	5.28	4.61	4.87
May	5.94	6.85	7.36	6.26	4.80	7.27	7.36	4.80	6.41
June	7.28	*	9.61	7.01	7.28	10.98	10.98	7.01	8.43
July	9.88	*	11.54	8.39	8.07	10.39	11.54	8.07	9.65
August	8.78	10.08	9.69	8.03	8.27	11.02	11.02	8.03	9.31
September	5.98	8.98	6.85	5.59	4.65	8.66	8.98	4.65	6.78
October	3.62	4.09	3.50	3.50	*	*	4.09	3.50	3.68
November	1.34	2.40	0.79	1.30	*	*	2.40	0.79	1.46
December	0.71	*	*	0.67	*	*	0.71	0.67	0.69
TOTAL	52.80	44.09	49.33	50.47	33.07	48.31	68.78	46.73	56.64

TABLE 2.2-7 (continued)

HAYDEN HILL PROJECT
REGIONAL ANNUAL RAINFALL DATA
(INFORMATION FROM KP, JULY 1990)
(RAINFALL IN INCHES)

					100 Year Return Period Rainfall		
Station	**Latitude**	**Longitude**	**Elevation**	**Mean Annual Rainfall**	**1 Hour**	**1 Day**	**1 Year**
Bieber	41/7/18	121/8/25	4130	17.00	0.68	3.32	30.06
Adin Ranger	41/12/0	120/57/0	4193	15.92		2.86	27.39
Eagle Lake Nelson	40/39/5	120/46/20	5121	16.22		4.37	31.41
Madeline HMS	41/3/20	120/28/18	5231	11.92		3.21	22.92
Madeline	41/3/0	120/29/0	5285	11.30			
Ravendale 1SSE	40/47/30	121/21/30	5310	10.83			
Ravendale Jim Marr	40/52/30	120/6/0	5540	10.73		3.02	21.09
Termo 6 SW	40/48/42	120/33/36	5320	13.94		4.78	26.4
Termo	40/52/0	120/27/0	5300	10.64	0.81	2.43	19.6
Jess Valley	41/09/36	120/19/48	5300	17.58			
Alturus Ranger	41/18/00	120/10/48	4400	12.18			
Susanville I WNW	40/26/0	120/40/0	4555	16.29	0.93	4.11	31.12

2.2.6 Monitoring

Monitoring will be ongoing throughout the life of the operation, during closure and for a post-closure period. A monitoring schedule will be established with the appropriate regulatory agencies prior to operation. Monitoring will be sufficient to detect any leakage of chemicals, as well as any adverse affects the Project might have on the environment. Monitoring is described in detail in the Mitigation Compliance Program (MCP) (Appendix D). Monitoring well locations are shown on Figure 2.2-6.

2.2.6.1 Heap Leach Facilities

The heap leach facilities will be monitored by the use of 4-inch diameter leak detection pipes receiving flow from between the liners beneath the ore. The pregnant and barren ponds will be sloped so that any leakage between liners will collect at inspection risers. The 4-inch diameter pipes will open end into the lined heap leach ditch so that any leakage flow will be clearly observed. Monitoring programs will be conducted as part of the operating process of the heap leach facilities. Monitoring will continue throughout the closure process and during the post closure period, although the frequency of the monitoring may be reduced as the post closure period progresses. Details of closure are described in the Reclamation Plan (Appendix E).

The response and action levels to be implemented for various volumes of leakage detected from the heap leach facilities and ponds will conform to U.S. Environmental Protection Agency (EPA) standards and CRWQCB regulations. Areas of the liners requiring repair will be patched or replaced depending upon the extent of the problem.

2.2.6.2 Surface Water and Groundwater Monitoring

Both surface water and groundwater are currently being monitored to develop baseline information for the Project area. Data from monitoring stations has been used to characterize the quality and quantity of the existing surface water and groundwater. The monitoring well locations are shown on Figure 2.2-6. Monitoring of these stations will be ongoing throughout mining operations as well as during and following closure. More detailed descriptions of sampling and monitoring procedures will be stipulated in the waste discharge requirements issued by the CRWQCB.

Surface water quality sampling points for the Project area have been located to capture run-off samples from the Preston Canyon, Letterbox Canyon, and Hayden Hill Road drainages, three primary drainages adjacent to the Project site. Additional surface sampling sites include Willow Creek, upstream and downstream from the confluence of the Hayden Hill Road drainage, upstream and downstream of the Preston Canyon Drainage and south of the Project in an unnamed drainage. Flows in Willow Creek are currently recorded by a gaging station about four miles downstream from the confluence of the Hayden

Hill Road drainage. These points have been monitored twice weekly for baseline water quality data and will be monitored monthly when the baseline data is complete. More detailed information on the water quality sampling point locations is presented in Section 3.6, Water Resources.

A staff gage is located at the Indian Spring site on the Hayden Hill Road drainage. A continuous chart recording flow meter is installed on a Parshall flume located in Letterbox Canyon downstream from the confluence of the Cemetery Gulch drainage. Based on CRWQCB recommendations, water quantity, depth, temperature, pH, conductivity, and air temperature have been measured twice weekly during water quality sampling. Currently, surface and groundwater continues to be sampled monthly.

Groundwater monitoring wells have been strategically installed within the Project area (Figure 2.2-6). These monitoring wells monitor water quality downgradient of the heap leach pad, tailings impoundment, waste rock dump, and the overall mine site. Baseline groundwater quality data are being collected from these monitoring wells. The monitoring wells range in depth from 200 feet to 1,000 feet. Several of the monitoring wells have been closely placed at one location to monitor both shallow and deep groundwater.

2.2.7 Ancillary Project Facilities

2.2.7.1 Access Road and Project Traffic

Project Traffic

During the construction and development phase, contractor employees will provide their own transportation to the site but will be encouraged to carpool at all times. Experience at similar operations has shown that car and van pools develop rapidly when commuting distances are lengthy. Parking will be provided at the site.

During the construction and operating phase, company employees will be transported to the mine in company vehicles. The Applicant will make arrangements for an appropriate parking area in Susanville (also in Adin/Alturas if sufficient demand exists) where most employees will use company-owned vehicles for transportation to the mine. Other employees will ride to the mine in personally-owned vehicles.

An accurate estimate of traffic volume to and from the site is difficult to make at present. During construction, personal vehicle traffic likely will average 25 to 30 trips per day and commercial traffic five to 10 trips per day. Company provided transportation should reduce the traffic volume during the operating phase to 10 to 15 trips per day for personal vehicles and three to five trips for commercial vehicles.

Access Road

The main access road to the mine site will be Hayden Hill Road, a County administered road heading south from its intersection with California State Highway 139 (Figure 2.2-1). This road is in good to fair condition. However, upgrading is required to ensure safety due to increased vehicular traffic during construction and operation and to accommodate public access around the mining operation. In order to widen the road to meet safety requirements, a ROW will have to be acquired from the USFS and from a few private property owners whose property is traversed by the road. If it is not possible to acquire the necessary ROW through the private lands by agreement, it may be necessary for the Applicant to request that Lassen County exercise its powers of eminent domain.

Upgrading and maintenance will be closely coordinated with the Lassen County Department of Public Works. The access road will be widened to a 24-foot wide running surface to handle two lanes of traffic. The road will be straightened where practicable, smoothed, and graveled where necessary to create an all-weather surface. Where the road is adjacent to drainages, berms will be constructed and emergency culvert closures will be provided to contain any spillages within the roadway. The road will be relocated around the Project facilities to maintain public access to areas near the site. The location of the access road is shown on Figure 2.2-1.

The intersection of the Hayden Hill Road and Highway 139 will be reconstructed. The proposed reconstruction will include a "fly by" lane, stream crossing and sight distance improvements to meet California Department of Transportation Standard Safety Regulations. The stream crossing will incorporate a bottomless culvert design to minimize impacts to the stream channel.

Public access to the Hayden Hill Cemetery will be provided. However, since the cemetery lies within the boundary of the Project, access must be supervised in some manner for safety purposes. A system of escorted access will be developed and established for this purpose. After Project closure unescorted access to the cemetery will be possible.

2.2.7.2 Haul Roads and On-site Service Roads

Interior haul roads will connect the pit, waste rock dump, and processing facilities (Figure 2.2-1). The haul roads will be a minimum of 80 feet wide to safely accommodate haul trucks, and will meet MSHA requirements. The haul roads will be constructed with safety berms on the outside edges and internal drainage ditches. The haul roads will be sloped into the hillside, and will be drained by ditches adjacent to the roadway with culverts under the roadway at selected locations. Normally, the maximum haul road grade will be 10 percent.

Other on-site roads include service roads for light truck and delivery truck traffic and service roads to the water supply well fields (Figure 2.2-1). Service roads for the Bunselmeier Spring and Preston

Canyon water supply wells will utilize existing road alignments and will be maintained to provide access to the well sites and pipeline routes. The Preston Canyon Road may be gated during and after pipeline construction to control erosion on the steep sections during the muddy seasons. The Snider Lake Road, which is a USFS road, will be used for routine maintenance.

2.2.7.3 Electrical Power

Electrical power for all of the Project facilities will be provided by a three-phase 69-kilovolt (KV) overhead transmission line extending from the Surprise Valley Electrification Corporation (SVEC) substation near Adin, California, approximately 17 miles to the north. The incoming power line will follow California Highway 139 and the Hayden Hill Road to a fenced substation located north of the crushing facility at the Hayden Hill site (Figures 2.2-7 and 2.2-1). The power demands for this Project are estimated to be 9,500 kilowatts (KW) connected load. The line will be owned and maintained by SVEC.

Power to run the pumps at the two water supply well fields in the Preston Canyon corridor (north-northwest of the site) and along the Bunselmeier Springs Road corridor (west of the plant) will be transmitted via underground power lines installed adjacent to existing roads. Power for the crusher, mill, processing facilities, warehouse, truck shop, and office complex will be routed from the substation via underground conduit and overhead lines.

2.2.7.4 Water Supply

The proposed mining and processing operations will require an average fresh water supply rate of 1,000 gpm. The primary mine water supply source will be groundwater from a well field along the Bunselmeier Spring Road corridor. A production well in Preston Canyon will be used as a back-up water supply. Water will be transported to the mine site in an underground pipeline adjacent to existing roads (Figure 2.2-1). The water pumps and pipelines will have a capacity of transporting 1,500 gpm, but will average about 1,000 gpm. All development will be conducted in accordance with pertinent Federal, State, and local laws, ordinances and regulations. The production wells will utilize water from the deep regional aquifer; not the local shallow perched aquifer.

The pipelines will be located underground and adjacent to existing roads. The disturbed surface area associated with each water supply pipeline, will be a maximum of 20 feet in width. Where the alignment deviates from the road, maximum width of disturbance will also be 20 feet. Where ephemeral drainages are crossed, the pipeline will be buried beneath the bottom of the drainageway. Two additional supply wells may be drilled in each well field corridor if required to meet water use requirements. The surface area disturbance for each well pad would be approximately 1600 square feet. The wells would not be placed directly in wetland areas.

Potable water for mine personnel will be provided by off-site vendors. Water for Project construction and dust control will be provided from the primary source. Water that accumulates in the pit from limited perched aquifers and from major storms will also be used for dust control, and will be pumped from sumps in the mine pit.

2.2.7.5 Administration and Laboratory Building

An administration building, shop and warehouse will be located north and west of the mill. A laboratory will be located next to the mill building.

2.2.8 Environmental Health and Safety

Health and safety is an important consideration during all aspects of a mining operation. Regulations are set forth by MSHA and the Occupational Safety and Health Administration (OSHA) to be followed during mining activities. These regulations will be adhered to during all operations to ensure employee and visitor safety on the Project site. Other health and safety considerations include the protection of surface and groundwater from leaks or spills of hazardous or toxic materials, the stability of Project components such as the waste rock dump, heap leach facility and tailings impoundment, and the protection of wildlife from exposure to cyanide.

2.2.8.1 Mining Operations

Procedures that will be utilized during the mining operation to protect health and safety are summarized below. These procedures are discussed in more detail in Section 2.2.2.

Waste Rock Dump
Studies indicate the waste rock materials should be classified as a Group C waste as defined in the California Hazardous Waste Management Regulations. Therefore, the waste rock facility design contains no provisions for a lining and leachate collection system. The Applicant proposes to monitor the waste as it is produced to evaluate it's conformance to a Class C classification. The guidelines for the monitoring program are included in the GSCP (Appendix M).

Blasting
Production blasting will utilize ANFO blasting agents and cap sensitive primers. Blasting agents will be stored in compliance with applicable BATF and MSHA regulations. The Project will comply with California Proposition 65 relative to materials handled on the site.

Blasting will be limited to daylight hours and monitored by licensed blasters. Vehicular traffic on adjacent roads will be halted during blasting. Safe seismic disturbance and air blast limits will be established to prevent damage to buildings. Although no problems are anticipated due to the blasting, corrective action will be implemented should problems arise.

Mining Equipment
Mining equipment will be fitted with original equipment mufflers, spark arrestors, and engine enclosures to reduce noise and fire potential.

2.2.8.2 Processing Operations

Procedures to protect health and safety during crushing and processing are summarized below. All facilities were designed to prevent the release of chemicals that could harm the environment. This is discussed in more detail in Section 2.2.3.

Crushing Facilities
The crushers will be located within enclosures to limit noise and contain dust. Dust will be controlled to meet air quality operating permit stipulations and health standards.

Heap Leach Processing
The heap leach facility is designed as a zero discharge or closed system. Discharge of process fluids to either surface or groundwater will be prevented by utilizing properly sized, constructed, and lined pads, ponds, and transfer systems.

The heap leach pad and process solution ponds have been designed to minimize the potential for solution leakage and provide for the detection and extraction of fugitive solution by using double synthetic pad liners and a LCRS. The heap leach processing area will be surrounded by an earthen berm or diversion ditch to prevent the escape of solutions from the facility in the event of a spill. The heap leach facility and process solution ponds will be fenced. A 42 inch high 4-strand barbed wire fence will be built around the southern portion of the property. A 42 inch high 4-strand barbed wire or smooth wire fence will be built around the northern portion of the property. Solution ponds will be fenced to exclude deer and pronghorn antelope and netted using a 1" mesh size to exclude migratory birds.

All solution will flow in pipes within lined ditches. Process solution ponds and diversion ditches are properly sized to hold and carry precipitation from storm events. All construction will be monitored and inspected by a California registered Professional Engineer.

Solution Application - Solutions will be applied to the heap by a spray and drip deployment method. Drip deployment may potentially reduce solution evaporation and consumption during heap leach application and exposure of solution to the environment.

Closure - Upon closure of the heap facilities, fresh water or a chemical detoxification process will be used to detoxify and neutralize the heap. When the effluent from the heap meets applicable quality standards, the solution will be allowed to evaporate by continued application to the heap. The berms surrounding the heap and the process solution ponds below the heap will be left in place, with their respective liners intact, for approximately two years following the rinsing process to allow for monitoring of leachate from the heap.

Present studies indicate the detoxified and neutralized heap should be classified as a Class C facility and a Group C waste for closure. The Applicant proposes to monitor the spent ore to evaluate its conformance to the Class C closure classification (see Appendix M).

Gold Recovery Process

The thickening, leaching, and CIP facilities are designed to contain and control process slurries and solutions. The containment area around the process tankage has been designed to contain spills. It is also designed to direct and drain large spills to the barren pond which is sized for this purpose.

2.2.8.3 Tailings Impoundment

The tailings impoundment is designed as a zero discharge facility with a single geomembrane basin liner, an LCRS and a decant system. The LCRS will reduce solution head pressure on the liner. Basal waters plus the surface decant water will flow into the reclaim sump or process water pond.

The process water pond will be double lined similar to the heap leach ponds, and will be sized to contain precipitation run-off from storm events.

Prior to deposition in the impoundment, the cyanide level of the mill tailings will be reduced to a level which is non-lethal to waterfowl. Natural degradation will further reduce solution cyanide levels.

Closure - Prior to permanent closure the cyanide and pH levels of the free supernatant solution will be reduced to permitted levels and the residual solution will be allowed to evaporate.

Present studies indicate the tailings management facility and enclosed wastes be classified as Group C for closure based on compliance with water quality standards. The Applicant proposes to monitor the tailings to evaluate the conformance to this group waste classification. The design of the tailings impoundment and the classification of the mill tailings is described in more detail in Section 2.2.4.

2.2.8.4 Monitoring

Monitoring will be ongoing throughout the life of the operation, during closure and for a post-closure period. Monitoring will be sufficient to detect the leakage of chemicals, as well as any adverse affects the Project might have on the environment. Monitoring is described in more detail in Section 2.2.6 and Appendix D.

2.2.8.5 Reclamation

Public safety will be considered during reclamation by the stabilization, removal, and/or fencing of structures or landforms that could constitute a public hazard. Safety hazards presented by the existing abandoned mine workings on the Project site will be eliminated by reclamation.

2.2.8.6 Fuel Storage

Fuel and oil for the diesel and gas powered equipment will be stored in above-ground, sealed tanks in the processing facilities area (Figure 2.2-3A). The tanks will be installed on concrete pads and surrounded by berms to contain the volume of the largest tank in the event of rupture.

2.2.8.7 Sanitary and Solid Waste Disposal

All sanitary and non-regulated solid wastes will be disposed of in accordance with all applicable Federal, State and County regulations. During drilling and the construction phase of the operation, portable toilets will be utilized for sanitary waste. The construction contractor will retain responsibility for maintaining these units in a clean and safe manner.

During operation of the Project, sanitary waste will be disposed of in underground septic systems. The septic systems will be designed to meet county specifications and will be permitted through Lassen County. The system capacity will be designed for 70 employees per shift.

Non-regulated solid waste such as wood, paper, and construction refuse will be disposed of in accordance with Federal, State and County regulations. Refuse will be hauled to an approved landfill.

2.2.8.8 Fencing and Site Control

The entire Project area will be fenced to prohibit livestock and access. The solution containment ponds for the heap leach facility will be fenced to exclude deer, antelope and smaller wildlife.

Solution ponds for the heap leach facility will be covered with netting to prevent access by waterfowl, shorebirds or other avian species. Process solutions will flow through enclosed pipes within lined ditches. Process solution ditches will not contain exposed cyanide.

Appropriate warning and caution signs will be placed throughout the Project are in accordance with State and County regulations. All on-site visitors will receive hazard recognition training in compliance with MSHA regulations.

2.2.8.9 Security

Security will be provided on a continuous basis by personnel working two, 12-hour shifts, 7 days per week, 365 days per year. A security office located at the entrance to the property will restrict access to the Project (Figure 2.2-3A). A second security office will be located in the mill/processing/office complex (Figure 2.2-3B). Access to reagent storage areas will be tightly controlled and monitored by security, health and safety personnel.

2.2.8.10 Chemical and Reagent Storage and Use

Chemical and Reagent Storage

The reagents required for the heap leach, milling, and gold recovery operations are listed in Table 2.2-4. These reagents will be delivered to the site by trucks operated by licensed haulers who will comply with California Department of Transportation regulations for transporting hazardous materials. The transportation route will be as described in Section 1.5.1. All reagent storage areas will be surrounded by berms sized large enough to contain any reagent spills. The cyanide used in the leaching process will be stored in sealed tanker trucks. The area will be clearly marked and closely monitored for leakage or spillage. The area will also be surrounded by a separate berm to prevent mixing of chemicals in the event of a spill. All employees will receive instruction on the safe use and handling of the chemicals used.

Sodium cyanide will be received from the manufacturer via their transport system and stored as dry briquettes or granules in 42-ton returnable tanker trucks. When empty, the tanker trucks will be returned to the manufacturer.

Corrosive materials (acids) will be stored as received. Caustic materials (bases) will be obtained in bulk liquid form and may be diluted for storage. Lime will be obtained as pebble lime stored in a silo and will be used for pH control, dry or slaked, in the mill circuits, and added dry at the heap leach.

Safe Handling Procedures for Sodium Cyanide Use in a Heap Leach Operation

To ensure that the cyanidation process is safe, the sodium cyanide solutions will be kept at a high pH. If the pH of the solutions drops below 10, cyanide ions can react with the water molecules in the solution to form hydrogen cyanide (HCN).

At a pH greater than 10, the reaction is greatly suppressed and little or no HCN can form. Hydrogen cyanide will be present in solution and may volatilize as gas depending on atmospheric temperatures and pressures. For this reason, all sodium cyanide solutions used in the heap leach process will have a pH of 10 or greater.

2.2.8.11 Fire Management Procedures

Adequate fire protection is an important component of any mining operation, both for protecting the resources, facilities, and Project personnel, as well as complying with MSHA and applicable State and County building codes. As specified by MSHA, the Applicant will institute a training program and have a rehearsed fire suppression plan.

A fire protection system will be installed which will incorporate Lassen County Code Requirements in the administration and warehouse complexes, truck shop, crushing plant and process plant. Hydrants will be located at all buildings. A 100,000-gallon fire water reserve will be stored in a water storage tank located sufficiently above and near the mill and crushing area to provide adequate water pressure. A fuel break will be constructed around the facilities. Two 9,000-gallon water trucks, used for dust suppression, will be available in the event of a fire. One mine rescue vehicle will be located on-site in the event emergency transportation is required.

Lassen Gold Mining, Inc. will promptly comply with any emergency directives and requirements of Lassen County, the BLM and the USFS pertaining to industrial operations during the fire season.

2.2.8.12 Emission Pollution Control

There are many separate devices and procedures planned to control the emissions of pollution to the air, water and ground. Pollution of water and ground could occur from sediments introduced to drainages and from fuel spillage. Emissions to air could include dust from the mining process, dust from ore crushing, combustion gases from the mining vehicles and heat sources in the process, and mercury vapor and refining furnace fumes from the refining process. The Best Available Control Technology (BACT), in conformance with the Lassen County Air Pollution Regulations as revised in April, 1991, will be utilized by the Project (Hansen 1991A). The following sections discuss these and other emission pollution control measures.

Fugitive Dust

Activities associated with the mining process will create dust, including the drilling, blasting and loading of material to trucks, and the hauling of waste rock and ore. Dust from blasting and loading cannot be controlled. Dry drilling activity will be controlled with dust collection devices or with water spray.

Water application using a tank truck will be the primary method of dust suppression on haul roads and disturbed areas at the site. Magnesium chloride, calcium chloride, or other dust suppressants may be applied to the roads to reduce dust generation. The specific controls to be used will be established in the Air Quality Authority to Construct and Air Quality Authority to Operate permit obtained from the Lassen County Air Pollution Control District (LCAPCD).

Crushing, screening and conveying equipment will have fog sprays for dust suppression in conjunction with wind fences as necessary. Controls on the crusher will consist of a sonic fogger system applied within shrouds below the crushers, at the dump pocket and around the screens. The conveyers for transport of ore to the leach pad will have water sprays at the drop points. Fly-dust from lime bins and cyanide storage areas will be ventilated to a baghouse.

The waste rock area will be built in lifts. As each lift is completed interim revegetation will take place. In the normal course of mining, haul road locations will change. As the roads shift, the unused parts will be revegetated to minimize dusting from the exposed surfaces. Growth media stockpiles will be seeded with a suitable seed mixture and mulched to reduce wind and water erosion.

The leach pad, which will be wetted with leaching solutions, is not anticipated to emit dust. The tailings impoundment will initially be deposited in a wetted condition, and will harden as it dries due to the high lime content. This facility is not anticipated to present dust problems.

The access road may generate dust depending on the surface material and the time of year. Water or a chemical dust suppressant similar to that used for the disturbed areas will be used, if there is noticeable dust from travel on this road. The MCC will monitor dust levels and direct control measures as required. Employee vanpooling will decrease the amount of dust generated from the access road.

Combustion Gases

Combustion emissions will occur from the mobile mining machinery, the support vehicles and the stationary, heat-generating, process equipment. All combustion equipment emits nitrogen dioxide (NO_2) and carbon monoxide (CO), with the engines emitting more per unit of fuel burned than the heaters. The mobile mining equipment is diesel-fueled and will emit some particulates. Combustion emissions from the operation of diesel-powered equipment are controlled by the pollution control devices installed by the manufacturer. To further minimize particulate and CO emissions, high quality fuel (containing no more than 0.25 percent sulfur) will be used, and the engines will be kept in tune through a regular preventative maintenance program.

Heat generating process equipment includes the solution heater, the mercury retort, the carbon regeneration kiln and the doré furnace. The doré furnace will be electrically heated. The remainder will be propane-fueled which is clean-burning, similar to natural gas.

Other Mining and Process Emissions

In the ore refining circuit, any mercury present in the ore will be refined and concentrated with the gold. When the matte, containing gold, is melted in the doré furnace, mercury will be released. Prior to smelting, the mercury will be captured with a retort, which is a device that heats the ore-bearing matte under a vacuum to evaporate, condense and collect the mercury as a liquid.

The doré furnace will release condensibles while melting the gold, zinc, fluxes and other refined constituents. A hood will be located over the furnace to draw in and cool the fumes. The cooling process will condense and route the fumes to a baghouse where nearly all particulates will be removed.

Combustion emissions from the retort furnace, the carbon regeneration kiln furnace and the solution heaters furnace will also be routed through a baghouse.

Sediment Control

Sediment control will be achieved by the use of seeding and mulching, silt fences, straw bale dams, diversion ditches with energy dissipators, and rock check dams at appropriate locations during construction and operation. All sediment control structures will be monitored and maintained on a regular basis.

Spill Prevention and Containment

Lassen Gold Mining, Inc. has developed a detailed Spill Prevention, Control and Countermeasure Plan (SPCC) and emergency response plan (ERP) to prevent and minimize the impacts of a chemical or fuel spill. The SPCC and ERP will be posted and distributed to key site personnel and will be used as a guide in the training of employees. The SPCC and ERP are on file with the Lassen County Planning Department and are included in Appendix L of this document. The plans will address mitigation of potential spills associated with Project facilities as well as activities of on-site contractors such as drillers. The SPCC and ERP cover fuels, reagents, and hazardous chemicals stored, used, transported to and transported from the Hayden Hill site. Emergency reporting procedures will be posted in key locations throughout the Project area.

Containment structures designed to prevent the migration of a spill are included in the design of the facilities. The plant site will have secondary containment structures in the areas where potentially hazardous materials are to be stored or used. The heap leach process areas will be lined and graded to drain into the pregnant solution pond. Physical methods of neutralization and control will be used in the event of a spill. Trained personnel will handle all hazardous materials and, in the event of a spill, will follow established procedures for containment and clean-up. In all cases, an SPCC Coordinator will be notified, who will then notify additional key personnel and agencies.

A Draft Hazardous Materials Incident Contingency Plan to establish the county's emergency response organization for hazardous material incidents is on file with the Lassen County Planning Department (Harvey 1990b). This plan outlines the procedures that will be followed in the event of an accident or spill during transportation of hazardous materials (fuel, cyanide, etc.) on Lassen County highways.

2.2.8.13 Sodium Cyanide

Cyanide has been used in various processing methods to extract metals from ore for over 100 years. The technology of using cyanide as part of a heap leach process was refined in the 1970s as a result of increased gold processes. Commercial applications of the technology has rapidly grown because it is one of the only economically feasible methods to extract gold and silver from low-grade ore deposits. It is estimated that in 1989, cyanide was used to extract over 80 percent of the 8.3 million ounces of gold and about 15 to 20 percent of the 60.8 million ounces of silver produced in the United States (US GAO 1991).

Sodium cyanide is a hazardous substance which is toxic to humans and wildlife. Because of its toxicity, there are many concerns related to its use. These concerns follow:

- The extreme toxicity of cyanide;
- The hazardous effects to employees during handling and use;
- The possibility of a spill during transportation or storage on the mine site;
- Wildlife deaths, particularly of migratory birds, by drinking cyanide process solutions from open ponds;
- Spills could contact ground or surface water, affecting human drinking water or fish and wildlife.
- The adequacy of existing laws and regulations governing mining operations that use cyanide.

These concerns are discussed below. Much of the following information has been condensed from the United States General Accounting Office's Report to the Chairman, Subcommittee on Mining and Natural Resources, Committee on Interior and Insular Affairs, House of Representatives (US GAO 1991).

Hazardous Effects of Cyanide

Sodium cyanide has a fairly complex chemistry. In heap leach and milling operations, the cyanide solution must be maintained under carefully controlled conditions. Otherwise, the solution begins to decompose, making the solution both less useful for extracting gold and less hazardous.

When leaks or spills occur, contact with air and with various components in the soil tends to quickly remove cyanide from solution and convert its toxic components into other less toxic forms. Thus, the amount of cyanide from a leak or spill that could otherwise reach surface water or be transported through soils, the major potential pathway for cyanide to contaminate ground water, is reduced. If cyanide solution reaches surface or ground water, it may or may not present a problem, depending on its volume, compositions and concentration. If its volume is relatively small or the solution is sufficiently dilute, it could be harmless. In sufficient quantity or strength, it could pose a risk to animals or humans.

While cyanide is lethal in large single (acute) doses, it does not accumulate in the body as a result of a number of small exposures over time (it has a low chronic toxicity). When wildlife drink from cyanide ponds, highly toxic hydrocyanic acid can form and react with iron in the blood to destroy the blood's ability to carry oxygen to the body. If the dose is strong enough, death could result rapidly. If not, the kidneys purge cyanide from the blood and the body recovers.

Hazardous Effects During Handling and Use

Although employees at heap leach mines work in close proximity to the process solutions, there are no known cases of accident or severe illness directly due to cyanide exposure. This is due to several factors. Cyanide in the process solutions will be of a dilute concentration (less than 500 ppm). To prevent the formation of HCN, the sodium cyanide solutions will be kept at a pH of 10 or greater. In addition, MSHA requires rigid employee training on the handling of reagents and process solutions and includes provisions for monitoring worker exposure levels.

Spill Prevention and Containment

Cyanide will be delivered to the site by trucks operated by licensed haulers who will comply with California Department of Transportation regulations for transporting hazardous materials. It will be stored in a fenced or enclosed facility. The area will be clearly marked and closely monitored for leakage or spillage, and will be surrounded by a separate berm.

Lassen Gold Mining, Inc. (LGMI) has developed a detailed SPCC and ERP plan to prevent and minimize the impacts of a chemical or fuel spill, including sodium cyanide. This plan is included in Appendix L.

Physical methods of neutralization and control will be used in the event of a spill by trained personnel. Established procedures will be used for containment and clean-up. In addition, a Draft Hazardous Materials Incident Contingency Plan has been developed which outlines procedures to be followed in the event of an accident or spill on Lassen County highways (Harvey 1990b).

Wildlife Deaths Due to Open Ponds

From 1984 to 1989, more than 9,000 cyanide-related wildlife deaths, including those of birds from about 80 species and mammals from 17 species, were reported in California, Nevada and Arizona. Approximately 90 percent of the reported wildlife deaths were of birds, mostly of migratory waterfowl. Although these deaths represent only a fraction of the bird deaths caused by hunting (less than 0.1 percent of the birds killed legally by hunters in the three states in 1 year), recently developed mitigation measures prevent most cyanide-related bird deaths.

Trial and error have shown that most wildlife deaths can be prevented by either restricting access to the cyanide solution by fencing the perimeter and covering the surface of cyanide ponds with netting or other materials, or diluting the solution to nonlethal levels with water or by chemical detoxification.

Spills

Discharges of cyanide solutions used in the heap leach operations could result from such things as faulty operating practices, leaking pond liners, storm overflows from tailings or process solution ponds, design flaws, and/or human error. There is a risk that if cyanide discharges do occur, they could reach surface water, thereby presenting hazards to fish and wildlife, and/or contact ground water, thereby adversely affecting water supplies.

Cyanide breaks down quickly into harmless substances when exposed to air and to various components frequently found in soil, such as minerals and microorganisms. Similarly, precipitation or other contact with water can quickly dilute cyanide solutions to nonlethal levels. In arid areas, where ground water is hundreds of feet below the surface, such as at the Hayden Hill site, the cyanide would probably break down into harmless components or be diluted before the spilled solution reaches the ground water.

Thirty-one inadvertent cyanide discharges from cyanide operations in California, Nevada, and Arizona have occurred since 1984. Federal and State officials believe that these discharges have resulted in minimal environmental damage because of the natural degradation of cyanide and because these discharges occurred in remote, arid areas. The few discharges that have contacted ground water have usually been in remote areas and have not affected drinking water supplies.

However, the long-term effects of cyanide that has seeped into the ground are not fully known. The US Bureau of Mines is conducting research to assess these effects.

Laws and Regulations Governing Mining Operations That Use Cyanide.

The public first became aware of the impact that cyanide operations can have on wildlife and the environment in 1986 when media reports called attention to large numbers of bird deaths from a cyanide operation on Federal land. At that time, no Federal or State agency had in place a strategy specifically aimed at minimizing the potential adverse impacts of cyanide operations. Recently, Federal and State oversight has increased.

Federal and State agencies have authority to regulate cyanide operations and protect wildlife and the environment from their potential hazards. The BLM and USFS have the primary responsibility and authority for protecting resources on Federal land, but in practice the authority and responsibility for ensuring that cyanide operations do not kill wildlife or degrade water quality are diffused among several Federal and State agencies.

As the Federal governments's principal land-managing agencies, the BLM and USFS are responsible for ensuring that mining operations on their land do not needlessly damage resources and comply with Federal and State laws. The Federal Land Policy and Management Act of 1976 (FLPMA) requires the Department of the Interior to prevent unnecessary and undue degradation of the public lands. The National Forest System Organic Act of 1897 gives the USFS similar authority to protect national forests, as well as to protect fish and game. The National Environmental Policy Act of 1969 (NEPA) requires Federal agencies to identify the impacts of major actions that may significantly affect the quality of the human environment.

On August 6, 1990, the BLM established a policy for managing cyanide operations on its land to ensure that these operations do not cause unnecessary or undue degradation. The policy sets out a broad range of principles to guide the BLM, including:

- Minimum acceptable design criteria, such as specific construction practices;
- Coordination among State and Federal agencies;
- Financial guarantees to ensure reclamation of mining operations;
- Mandatory reporting by operators of wildlife deaths and cyanide discharges;
- Quarterly BLM inspections;
- Training for BLM employees involved in the surface management of cyanide operations; and
- Procedures for closure and reclamation.

The Department of the Interior's Fish and Wildlife Service (USFWS) is responsible for preventing the illegal killing of migratory birds through the Migratory Bird Treaty Act (MBTA). Under the act, causing the death of migratory birds without a license or permit is a criminal offense. In addition to the USFWS, the State of California has established the California Department of Fish and Game (CDFG) to protect fish and game. The CDFG has a general authority to issue citations to those killing game species without a license.

The EPA is primarily responsible for protecting the quality of the nation's surface water under the Clean Water Act (CWA). States have been delegated EPA's responsibility for protecting surface water and are also responsible for protecting their ground water. California has primary responsibility for protecting the quality of its own ground water by the Porter-Cologne Water Quality Control Act, which also provides authority for the State to exercise the water protection authority delegated to them by the EPA. The responsible State agency for both surface and ground water for the Hayden Hill Project is the CRWQCB.

The State agencies administering these laws require cyanide operators to apply for a permit before they begin operations. To obtain a permit, operators must meet certain requirements, such as the minimum design and construction standards that the State has developed to ensure that hazardous substances, including cyanide, will not be discharged into the environment or that discharges will comply with State standards. The State has also established monitoring and reporting requirements for the discharge of hazardous chemicals, including cyanide, to surface and ground water. Operators that violate discharge requirements are subject to various penalties.

2.2.8.14 Summary of Slope Stability Analyses

Methods of Analyses

The slope stability of the heap leach, tailings disposal, and waste rock facilities were evaluated using the commercial slope stability program PCSLOPE. The computer program was utilized to evaluate slope stability by means of conventional analytical techniques, whereby forces driving the slope failure are compared to forces resisting failure. In general, the ratio of resisting forces to driving forces is equivalent to the safety factor (SF). A SF greater than 1.0 indicates stability.

A pseudostatic method of analysis was utilized to evaluate the stability of selected facilities. The pseudostatic method models cyclic seismic forces as static forces. The magnitude of this force is a function of the seismic acceleration produced by the earthquake event. Seismic design parameters were derived from a probablistic seismic risk analysis used to derive peak horizontal ground acceleration at the Project site. A peak ground acceleration of 0.144g (14.4 percent of gravity) corresponding to a seismic event with a 475 year recurrence interval was selected for use in the stability analyses (KP 1990b).

Heap Leach Facility Stability

The stability of the heap leach facility was evaluated along an east-west trending critical cross-section bisecting cell 1a of the leach pad. Stability was evaluated for a heap height of 120 feet, and considered the existence of a variable phreatic (water level) level within the heap. The anticipated slope failure mode consisted of a wedge type failure along the pad liner interface and progressing to the heap crest.

Material properties assumed for the stability analyses include a unit weight of 84.5 pounds per cubic foot (pcf), and a friction angle ranging from 42 degrees at the heap surface to 37 degrees at depths of 70 feet or greater. The friction angle for the ore liner interface is 17 degrees as determined for confining stresses equivalent to heap heights as great as 70 feet, approximately (KP 1990a).

Under anticipated conditions of operation, the resulting SF for the critical wedge is 1.3, indicating stability under static loading conditions. The critical height of the phreatic surface required to induce instability (ie: SF = 1.0) was determined to be 25 feet, approximately. During normal operations of the heap leach facility, the phreatic level is anticipated to be no greater than 1 foot above the leach pad liner.

The analyses indicate that under normal operational conditions the heap leach facility will remain stable. Earthquake loading is expected to have little effect on the overall stability of the heap slopes, with minor sloughing and surface settlement expected (KP 1990a).

Tailings Disposal Facility

The exterior slope of the full embankment and the interior slope for the individual embankment stages were evaluated as critical components to the stability of the tailings disposal facility. The stability analyses considered the integrity of the embankment under static and pseudostatic loading conditions, as well as the case of seismically induced tailings liquefaction, where the tailings essentially lose all strength to support applied loads. A phreatic surface resulting from water ponding at the tailings surface was assumed for the analyses.

Material properties utilized in the stability analyses were derived from laboratory testing of materials, as well as published correlative values. Material properties utilized in the analyses are summarized as follows (KP 1990a):

Material	Unit Weight (pcf)	Friction angle (degrees)
Tailings	117	32
Liquified tailings	117	0
Embankment core	108	37
Rockfill zone	108-110	42-46
Foundation	98	32

The results of the stability analyses are summarized as follows (DK 1990a):

Exterior embankment slopes:	
- longterm (static) stability	SF=1.61
- pseudostatic stability	SF=1.14
- liquified tailings (static)	SF=1.43
Interior embankment stage slopes:	
- construction (static) stability	SF=1.27
- pseudostatic stability	SF=1.27
- liquefied tailings (static)	SF=1.54

In all cases evaluated, the analyses indicate that the embankment will remain stable.

Waste Rock Dump Stability

The stability of the waste rock dump facility was evaluated using methods, parameters, and standards established by the U.S. Forest Service. The stability analyses evaluated various stages of dump development. The stability of the waste rock dump was evaluated under static conditions for a sliding wedge type failure mode.

The waste rock dump facility was modelled having an effective overall outslope of 2.8H:1V (horizontal:vertical), resting on an average ground slope of 30 percent. The resulting static SF for the ultimate dump configuration is 1.8. The static analysis indicates that the facility design, in general, is not susceptible to catastrophic failure.

Additional analyses were conducted to assess the stability of a single lift, or lobe of the facility. The stability of each lift was evaluated for various ground slopes and lift slope configurations. The analyses indicated that to satisfy U.S. Forest Service standards, lift slopes at the angle of repose (approximately 1.3H:1V) should not be placed on ground slopes exceeding 34 percent. Alternatively, lift slopes may be flattened or buttressed on ground slopes steeper than 34 percent to satisfy stability criteria.

2.2.9 Project Work Force

Short-term personnel requirements for pre-production Project activities are estimated to be approximately 150 full time equivalents (FTEs) or employees, based upon LGMI's past experience and the results of a feasibility study. The number of FTEs in this phase will vary to meet specific staffing requirements during on-site work. Pre-production activities, including additional drilling, road upgrades, facility construction, fencing, etc., will utilize professional contractors managed by LGMI. The pre-production construction phase will require types of skilled and unskilled labor typically associated with industrial construction projects.

Long-term personnel requirements for Project operations are expected to average 210 FTEs for all shifts from onset of production through the mine life. Because this number represents all shifts, the number of employees on-site at any given time probably will not exceed 70. The mining, crushing, milling, and leach pad operations will necessitate heavy equipment operators and mechanics, while the processing operations will require personnel experienced in gold and silver recovery technology. The estimated categorization of employees is 25 percent supervisory, professional, and support; 55 percent operating personnel; and 20 percent maintenance personnel.

The majority of the employees will most likely reside in Lassen, Shasta, and Modoc Counties and will commute from Susanville, Eagle Lake, Adin, Bieber, Burney, the Fall River Valley area, and Alturas. It is anticipated that most of the work force will reside in or around the Susanville region with a lesser number in the Adin and Alturas areas.

2.2.10 Project Schedule

Construction and mining activities for the Project will begin following receipt of all required permits and approvals. Construction is anticipated to require approximately eight months, depending on weather and, to begin following issuance of permits with pre-production stripping to commence approximately three months later. Construction could take as long as twelve months due to seasonal delays. Mining, milling, heap leaching, and precious metal recovery could begin as early as eight months after issuance of permits and will continue for approximately 8 years. A time line is not presented at this time due to the variance which would be caused by an unknown starting date.

2.2.11 Reclamation and Closure

Reclamation of areas disturbed by the Project will comply with FLPMA, the Forest Management Act, the Surface Mining and Reclamation Act (SMARA), and County requirements in order to minimize water degradation, air pollution, damage to aquatic or wildlife habitat, and erosion, while at the same time providing for a continuation of existing uses including livestock grazing, watershed protection, wildlife habitat, and upland recreation. The State of California, Department of Conservation, Division of Mines and Geology will measure compliance of the Reclamation Plan in accordance with Title 14, California Code of Regulations, Section 3502. The USFS will evaluate the Reclamation Plan with respect to Title 2800 of the Forest Service Manual, Chapter 2840. On BLM administered lands it is the BLMs responsibility to ensure mining operations are completed in conformance to the 43 CFR 3809 regulations.

The Reclamation Plan has evolved with the EIR/EIS process and has been updated by LGMI for this document in response to comments received from the Draft EIR/EIS. Additional agencies involved in the formulation of the Reclamation Plan include the United States Department of Agriculture Soil Conservation Service, the Pit Resource Conservation District (RCD), the California Department of Mines and Geology, the Department of Fish and Game, and the CRWQCB. Lassen Gold Mining, Inc. established a formal Conservation Agreement with the RCD in late December, 1988. The Reclamation Plan for the Hayden Hill Project is briefly summarized in this section, the Reclamation Plan is included in Appendix E.

2.2.11.1 Reclamation Overview

The approach and design of reclamation procedures for the Project will be directed by certain site-specific constraints as well as by several overall objectives for reclamation. Reclamation goals for the various Project areas and components include:

- Establishment of stable surface, topographic and drainage conditions that are generally compatible with the surrounding landscape and serve to control erosion. This includes contouring slopes as necessary, practical and feasible.
- Minimization of pollutant formation and on-site containment of any unavoidable toxicity problems to protect the quality of ground and surface water resources.
- Establishment of surface soil conditions most conducive to regeneration of a stable plant community through stripping, stockpiling, and reapplication of suitable plant growth media or soil material.
- Establishment of site specific species lists, revegetation techniques, practices and erosion control techniques through the use of on-site research and trials during the operational life of the mine.
- Revegetation of disturbed areas using species with a high probability for successful establishment, including native and introduced species, in order to establish long-term productive plant communities compatible with planned future land uses.
- Consideration of public safety through the stabilization, removal, and/or fencing of structures or land forms that could constitute a public hazard.

Reclamation procedures have been designed for the semi-arid climate and specific soil conditions of the Project area. Variable and moderate annual average precipitation, poorly developed soils and high insolation rates are among the stress factors affecting revegetation efforts in northeastern California.

Restoration, or the exact or nearly exact replacement, of the pre-mining natural communities is unlikely. However, the Reclamation Plan objective is to establish communities capable of evolving toward the stage of pre-mining communities. The approximate post-reclamation contours are shown on Figure 2.2-8.

The proposed reclamation techniques for this area, including preservation of soil materials, stabilization of disturbed areas, and preparation of seedbeds, should result in a successful program to reclaim the area to an appropriate land use. The post-mining land uses for the Project area are livestock grazing, watershed, recreation, wildlife habitat, and minerals exploration.

Reclamation planning and implementation are anticipated to be ongoing programs concurrent with operations. Reclamation efforts will be implemented at the earliest feasible time, except to the extent necessary to preserve evidence of mineralization.

As the Project construction and development progress, Project personnel will work closely with reclamation specialists from Lassen County, the BLM, the USFS, the Division of Mines and Geology, and the SCS to produce a viable, practical and cost-effective closure and reclamation program which meets the needs and requirements of all agencies. A success evaluation will be included to monitor the reclamation program. The success evaluation is explained in detail in the Reclamation Plan presented in Appendix E. Monitoring of reclamation procedures to ensure compliance is described in the MCP found in Appendix D.

2.2.11.2 Implementation

Various aspects of the Reclamation Plan will be implemented at different stages of the Project and will begin prior to construction and continue throughout operations and closure. Reclamation and associated activities are summarized below:

- Preconstruction: This phase includes the EIR/EIS preparation wherein baseline data has been collected to characterize the existing environment at Hayden Hill. These data are summarized in Chapter 3.0 of this document. The data are essential for formulating feasible reclamation goals and for measuring the effectiveness of reclamation efforts.

- Construction: During this phase, plant growth media will be removed, stockpiled separately by vegetation type, and seeded for interim erosion protection. In some cases seeds may be collected for future reseeding efforts.

- Operation: In areas where activities are discontinued, reclamation efforts such as re-contouring, scarifying, replacement of soil material and revegetation will be conducted as soon as practical.

- Closure and Final Reclamation: Upon closure of the mining operation, all facilities will be reclaimed according to measures prescribed in the Reclamation Plan. These will include the following:

  Mine Pit: The objectives of reclamation efforts for the pit will be to stabilize the site and maximize public safety. Raptor and passerine nesting and roost sites will be provided by any remaining cliffs. Reclamation of the pit will involve placing soil materials on the benches and bottom areas, in selected locations, and revegetating these sites. Jeffrey pine seedlings will be planted in select areas. The steep areas between benches and the remaining surface areas will be hydraulically seeded as practical and feasible. Growth media placement, seedling planting and seeding will be dictated by the logistics and safety of reaching these areas. The pit will be fenced, or berms constructed, and posted with warning signs.

  Waste Rock Dump: The waste rock dump will be reclaimed to blend into the surrounding topography to the extent practical. The crests of the dump will be rounded where practical and proper drainage will be maintained through the area as described in the Reclamation Plan. Growth media will be spread on the benches and, as available, on portions of the faces. The benched areas will be seeded and planted with Jeffrey pine seedlings as shown in the Reclamation Plan. The sloped areas between benches will be hydraulically seeded. Logs will be placed for wildlife habitat as they become available through the stripping process.

  Heap Leach Facility: The goal of reclamation efforts for the heap leach area will be the creation of contoured, vegetated slopes which blend into the surrounding slopes of the area. Reclamation of the heap leach area will consist of the following: Neutralizing the heap using fresh water, and if necessary, a detoxification chemical; spray evaporating any remaining neutralized solution; the pond liners will remain in place until testing indicates the requirements of the CRWQCB have been met, at which time they will be removed; shaping or reforming the ponds for sediment control; fracturing and burying all concrete structures; and re-contouring, topsoiling, and revegetating the heap and pond areas. All reclamation procedures will comply with standards established by the regulatory agencies.

  Tailings Facility: The tailings facility is designed and will be operated to maximize the drying of tailings when placed and to minimize pond area. Following closure of the mine, the tailings impoundment will be engineered and contoured for flood control. Storm water run-off will be directed away from the top of the impoundment minimizing surface erosion. The impoundment will then be covered with growth media and revegetated. The return water pond at the base of the lower impoundment dike will remain to collect waters from the LCRS until testing indicates that residual cyanide levels and other water quality parameters meet requirements of the

CRWQCB. The pond will be reclaimed in a manner similar to that for ponds at the heap leach facility, and left in place to control potential sediment from the tailings.

Mill/Processing/Office Complex and Buildings: Buildings and structures (administration, process facility, crusher and mill site, storage and shop facilities, etc.) will be dismantled and removed from the site following final closure. Concrete and pavement will be rubbelized and buried. The remaining disturbances will be ripped, scarified as needed, smoothed, contoured if necessary for surface drainage control, covered with growth media and revegetated.

Roads, Fences, and Miscellaneous Areas: Prior to final mine closure, Lassen County, the BLM, and the USFS will determine whether any site roads and fences should be left intact. Those roads designated for removal will be blocked to prevent access, graded for drainage, cut and fill slopes contoured, scarified or ripped, and reseeded. Several fence lines will remain during reclamation, including the site boundary fence and the solution pond fence. These fences will be removed following reclamation. Security fences will be removed when the plant buildings have been dismantled and the sites reclaimed. Fences around solution ponds will be removed when solutions have been neutralized in compliance with CRWQCB. Miscellaneous areas including the pumping stations and power substation will be reclaimed in the same manner as the building sites. Overhead electrical transmission lines will be removed. The power supply line will be removed from the site to the intersection of Highway 139 and Road A2.

Wetlands: The wetland areas which will be disturbed by the Project will be mitigated by the construction of an 18.5 acre seasonally inundated wetland. The mitigation wetland will be constructed in Section 2, west of the Project. The wetlands mitigation plan is included in Appendix I. Please refer to the plan for specific information. The plan allows for approximately three acres of mitigated wetland to one acre of disturbed wetland. The quality of the mitigated wetland is expected to be superior to the disturbed wetlands. The wetlands mitigation plan is anticipated to be in compliance with the EPA and Corps of Engineers 404 permitting process.

2.2.11.3 Reclamation Costs and Bonding

To guarantee completion of Project reclamation, a bond is required by SMARA. Bonding of reclamation procedures is also permitted under various land management regulations, and BLM policy requires bonding for cyanide heap leach operations on public land. The CRWQCB also requires bonding. The bond amount has been determined by Lassen County, the BLM, the USFS, the California Division of Mines and Geology and the CRWQCB based upon the final design plans for the acreage to be disturbed and the projected costs of closure and reclamation.

It is proposed by LGMI that Lassen County, through a memorandum of understanding with other agencies, will hold the required bonds. The MOU will establish procedures for bond release ensuring that all signatory agencies concur before the bond is released. A cost analysis of reclamation as proposed for the Hayden Hill Project has been developed based upon extensive experience within Amax Gold Inc. and AMAX Inc. (parent company of LGMI). Reclamation costs, in 1991 dollars, are estimated to be $6,077.00 per acre, or $5,894,711.00 for the Project. The costs for dismantling and removing buildings and structures, closure and post-closure monitoring are included in the reclamation cost analysis.

2.3 Alternatives

Numerous alternative designs have been identified and evaluated during the preparation of the Draft EIR/EIS. Alternatives to the Proposed Action have been developed in response to Issues, Concerns and Opportunities (ICOS) identified by responsible agencies, the public, and Project specialists. The fixed spatial nature of an ore body and the technical and economic constraints associated with developing a mine limit the number of feasible alternatives for a mining project such as Hayden Hill. This EIR/EIS evaluates reasonable alternatives identified to date and the No Action Alternative. Descriptions of the Proposed Action and the alternatives considered in detail provide the basis upon which the existing environment will be evaluated for potential impacts. The goal of this environmental review process is to identify procedures to reduce, mitigate or eliminate negative impacts associated with the Hayden Hill Project.

Alternatives to the Proposed Action are divided into two categories; alternatives considered but eliminated from further consideration and alternatives considered for detailed study, which includes the No Action Alternative. The alternatives eliminated from detailed study were rejected for reasons relating to engineering design, economic feasibility, and adverse environmental impact. The No Action Alternative retains current environmental and economic conditions. Alternatives considered for detailed study have been developed to respond to potentially significant Project impacts. A summary of the impacts due to each alternative, including the Proposed Action is included in Section 2.3.2. Analyses of the potential impacts associated with each alternative studied in detail, including the Proposed Action and the No Action Alternative, are presented in Chapter 4.0.

2.3.1 Alternatives Considered for Detailed Study

Those alternatives to the Proposed Action considered for detailed study are described in this chapter, and are summarized in Table 2.3-1. Each alternative is compared to the Proposed Action in terms of its environmental consequences in Chapter 4.0, and summarized in Section 2.3.2.

The No Action Alternative, or no Project, is included in this discussion of alternatives as required by CEQA and National Environmental Policy Act (NEPA) regulations. The No Action Alternative would

TABLE 2.3-1

SUMMARY OF ALTERNATIVES CONSIDERED FOR DETAILED STUDY

Alternative	Proposed Action	Major Differences
No Action Alternative	• Hayden Hill Project	• No Project
Pit Backfilling Alternatives		
• Comprehensive Backfilled Pit	• No backfilling • NW waste rock dump	• Extended time of operation to backfill • Phased mining operations • Pit would be entirely backfilled • Waste rock dump would be the same size and eventually waste rock would be returned to the pit
• Partially Backfilled Pit	• NW waste rock dump • No backfilling	• Phased mining operations • Extended time of operation • Providence zone would be partially backfilled as sequential mining/backfilling would allow • Smaller waste rock dump
Waste Rock Dump Design Alternatives		
• Complete Benching Alternative	• Benching down to the 5,750-foot contour only • 3:1 overall slopes above 5,750-foot contour • Angle of repose below the 5,750-foot contour	• Extended time of operation • Dump constructed as in Proposed Action then two benches added at toe • Total benched surface final result • Additional disturbance
• Smoothed Waste Rock Dump	• Benching down to 5,750-foot contour only • 3:1 overall slopes above 5,750-foot contour • Angle of repose below 5,750-foot contour	• Extended time of operation • Dump constructed as in Proposed Action then benches removed at closure • 3:1 smooth surface final result • Additional disturbance
Facilities Location Alternative 3	• Impacts wetland areas	• Avoids some wetland areas
Fire Tower Alternative	• Dismantle and store on-site • Build new lookout at Snag Hill	• Reconstruct at the Bieber Museum

TABLE 2.3-1 (continued)

SUMMARY OF ALTERNATIVES CONSIDERED FOR DETAILED STUDY

Alternative	Proposed Action	Major Differences
Power Supply Alternative	• SVEC would own, install, and maintain a new power line to the mine site • Power would be available for private use resulting in growth along Highway 139	• LGMI would own, install, and maintain the power line • The power line would be removed after Project completion
Enclosed Cyanide System Alternatives		
• Floating Cover	• Process ponds covered by netting • Solutions routed in pipes within lined ditches	• Process ponds covered by solid HDPE liners
• Tanks and Process Ponds	• Process ponds covered by netting • Solutions routed in pipes within lined ditches	• Process ponds and steel tanks • Tanks surrounded by lined ponds to contain storm runoff and spills or ruptures

constitute maintenance of the status quo, meaning the BLM would not approve the POO and the County would not approve the Conditional Use Permit (CUP) for the Project.

Based on review of the possible alternatives to the Proposed Action, nine alternatives were found to be technically feasible and provide the potential to reduce the Project's level of environmental impact. These alternatives are: The Comprehensive Backfilled Pit Alternative, the Partially Backfilled Pit Alternative, the Complete Benching Alternative, the Smoothed Waste Rock Dump Alternative, Facilities Location Alternative 3, the Power Supply Alternative, the Fire Tower Relocation Alternative and two Enclosed Cyanide System Alternatives. These alternatives, as well as the No Action Alternative, are described in this section and are considered in detail in the remaining chapters of this document.

2.3.1.1 No Action Alternative

The No Action Alternative is considered as a requirement of the NEPA and CEQA regulations. The No Action Alternative would eliminate those negative impacts which the Project would generate (refer to Environmental Consequences, Chapter 4.0). This alternative provides a basis from which to measure the impacts of the other Project alternatives including the Proposed Action. Because much of the area was previously disturbed by mining and exploration activity, the Project area would ultimately bear evidence of mining even if the Proposed Action were not implemented. Specific legislation is required to implement this alternative.

The No Action Alternative would eliminate from consideration the recovery of the delineated mineral resource proposed by the Applicant. The resource would thus remain in place as a potentially recoverable deposit. The General Mining Law of 1872 gives individuals and businesses the Federal right to pursue a mining operation on Federally managed lands as long as it does not cause undue or unnecessary degradation of the public lands. The No Action alternative for the Project would not preclude continued mining exploration on and around the Project site. Other mining interests are not likely to ignore the identified presence of the mineral deposit and may submit future POOs and applications for CUPs for a similar operation.

Due to past exploration and mining, approximately 200 acres have been previously disturbed. The causes of these disturbances include road cuts and fills, waste rock and spent ore piles, and compacted areas of roadways and drill pads. A portion of this disturbance is historic; caused before regulations existed, and will not be reclaimed under the No Action Alternative. Approximately 5 to 10 acres would be reclaimed under this alternative.

Any economic or other positive benefits the Project may have would not be realized if the No Action alternative were enacted.

Adopting the No Action Alternative would mean the existing fire tower would not be impacted and replacement or relocation would not be required. Proceeding with the Project would require relocation of the fire tower and construction of a new tower meeting modern safety and building requirements.

2.3.1.2 Pit Backfilling Alternatives

Alternative locations for the waste rock dump include physical constraints such as storage capacity and hauling distances from the mine pit; environmental constraints such as potential impacts on surface and groundwater, wildlife, vegetation, and soil resources; and economic constraints such as the absence of potential economic mineral resources in the waste rock disposal area. As discussed under waste rock dump in Section 2.3.3, location options which minimize the disturbed acreage and hauling distances are severely limited. However, two possible alternatives for waste rock disposal, presently planned for placement in a waste rock dump on the northwest side of Hayden Hill, are totally backfilling both pit zones, and partially backfilling a portion of the Providence zone. Either of these alternatives would reduce the physical size of the waste rock dump as compared to the Proposed Action. Both alternatives are described below.

Comprehensive Backfilled Pit Alternative

The Comprehensive Backfilled Pit Alternative would require phased mining operations not included in the Proposed Action. Instead, the pit would be mined and waste rock would be placed on the northwest side of Hayden Hill until a portion of one of the pit zones was mined out and backfilling could begin. The mining operation and design would be similar to the Proposed Action. The logistics of such a phased operation is complex and requires handling, of some portions of the material, twice. The waste material would be reclaimed in the pit area, leaving only a minimal amount of pit highwalls and steep slopes un-revegetated. Reclamation of the disturbed area would proceed after the waste material was returned to the pit in accordance with the Reclamation Plan.

Placing the waste rock in a temporary dump slightly decreases the acreage to be disturbed by the waste rock compared to the Proposed Action. However, if gold prices rise, it is possible any backfilling of the pit at Hayden Hill could require increased efforts to mine the ore in the future.

Equipment necessary for the backfilling operation would be similar to the Proposed Action. However, the duration of the Project would be extended by approximately four years to allow for the extra transport of waste rock back into the pit after mining is complete.

Partially Backfilled Pit Alternative

This alternative involves mining the open pits by phased mining such that waste rock produced from one pit would be sequentially placed or backfilled into a pit that has been mined out in terms of presently identified minable reserves. This would be difficult to accomplish due to the fact that only one pit will actually be developed under the Proposed Action. This alternative is not physically impossible because the proposed pit contains two ore zones which may be sequentially developed once the proposed pit is mined down approximately 500 to 600 feet.

For this alternative, mining would begin by developing the pit containing both the Lookout and Providence zones as proposed and depicted in Figure 2.2-1. Waste rock produced during this phase would be placed in the proposed waste rock dump. Once the pit has been developed or excavated down approximately 500 to 600 feet, the operators would begin mining out the Providence zone, also placing the waste rock produced within the proposed waste dump. Once the Providence zone is mined out, the operators would shift their activity to the northeast area of the pit and begin mining the Lookout zone (Figure 2.2-1). Waste rock produced from this zone would be placed in the mined out Providence zone, partially backfilling that zone. The Lookout zone would remain as it was mined, not backfilled.

Backfilling the Providence zone would effectively preclude any later extraction of lower grade ore contained within the total ore reserves below and surrounding the present economic reserves, should the price of gold increase above its present level. The opportunity costs associated with this method of waste disposal, depending on the gold price, could be quite high in relation to the costs of backfilling and the fact that the backfilled material would have to be re-excavated to reach the remaining ore reserves.

Additionally, because of the metallurgy of the deposit, ore from the Providence zone must be mixed with ore from the Lookout zone for milling. This would preclude mining the Providence zone separate or independent from the Lookout zone.

Equipment necessary for the partial backfilling operation would remain the same as required for the Proposed Action. The duration of the Project would not be extended as a result of this alternative.

2.3.1.3 Waste Rock Dump Design Alternatives

Design alternatives considered for the waste rock dump include benching the dump all the way to the toe, or smoothing the benches out after completion of mining and dumping. Benching the waste rock dump from the top down to the 5,750-foot elevation was determined to be the alternative most conducive to production and was presented in the Proposed Action. The design alternatives of benching the entire dump, and smoothing the waste rock dump after completion are considered in detail in the following chapters and described below. The waste rock dump outlines of the Proposed Action and the two alternatives are shown on Figure 2.3-1. Cross-sections of the waste rock dump alternatives are shown on Figure 2.2-2.

Complete Benching Alternative

An alternative of constructing benching over the entire waste rock dump is being considered to reduce erosion and increase stability in the area below the 5,750-foot elevation level. This alternative would require the dump to be designed and engineered similar to the Proposed Action except benches below the 5,750-foot level would be added after dump completion. The construction and hauling distances would be similar to the Proposed Action. The benches would be similar in design, incorporating angle of repose faces with flat benches in a 3H:1V overall slope. Reclamation would be similar to the Proposed Action in that the flat bench areas would be covered with growth media and revegetated while the faces would not be covered with growth media. The amount of disturbance would be approximately 20 acres more than the Proposed Action. The increased disturbance is primarily Jeffrey Pine/Mountain Shrub vegetation.

Smoothed Waste Rock Dump

The purpose of this alternative is to decrease visual impacts since the elimination of benches would result in a more natural-appearing landform. A smoothed, 3H:1V overall, waste rock dump alternative would be created by regrading the dump after completion of mining and dumping. The dump would be constructed with benches, as with the Proposed Action. At the time of closure the benches would be graded out by bull dozing. This operation is expected to require approximately one to two years of additional work. The Smoothed Waste Rock Dump Alternative would disturb approximately 52 acres more land than the Proposed Action, including an area of riparian habitat in Letterbox Canyon. The additional disturbed vegetation is primarily Jeffrey Pine/Mountain Shrub. Reclamation for this alternative would differ from the Proposed Action as the entire dump would be revegetated instead of just the flat bench surfaces. Growth media supplies may not be sufficient for a complete 12-inch cover over the entire dump. If supplies are insufficient a thinner layer would be used. Concurrent reclamation is not possible with this waste rock dump design.

2.3.1.4 Facilities Location Alternatives

Three facilities arrangement alternatives were identified as feasible concepts. The first two are presented in the following section on alternatives eliminated from further study. The third is a facilities arrangement which avoids the wetlands and one sage grounse lek in the area of the heap leach pad. This alternative, referred to as Facilities Location Alternative 3, is discussed below and shown on Figure 2.3-1. The potential environmental impacts, mitigation measures and unavoidable impacts associated with this alternative are discussed in Chapter 4.0.

Facilities Location Alternative 3 is intended to reduce the impact to wetlands identified in the area of the heap leach pad. The stock pond located in the south central part of the proposed heap leach pad will be avoided with this alternative. Figure 2.3-1 shows the configuration for this alternative. The height of the heap would be less for this configuration. The design concept and all other facilities remain the same as the Proposed Action with this alternative, only the heap leach pad configuration is changed.

2.3.1.5 Power Supply Alternative

The purpose of this alternative is to reduce the potential growth inducement caused by the availability of power in the area. A public service company is required to supply power to anyone requesting service, if it has a line within reasonable access. Growth inducement was identified during the EIR/EIS process, as a possible impact of installing the power line into the area. An alternative for the Project power supply is for LGMI to own the portion of the power line from County Road A2 to the site. In this Alternative, LGMI would use the same alignment, ROW and engineering design as described in the Proposed Action. The only difference being, LGMI would install, own and maintain a portion of the line. After Project completion, the power line will be removed from the mine site to County Road A2.

2.3.1.6 Fire Tower Alternative

The Project will require the removal of the existing CDFFP owned, Hayden Hill fire lookout tower. An alternative to the Proposed Action of dismantling the tower and storing it on-site is to reconstruct it at the Bieber Museum. The following discussion presents the alternative sites considered for reconstruction.

Several alternatives have been considered which incorporate relocating the existing fire tower. These alternatives include different options depending on whether or not transference of the ownership of the fire tower from State to private jurisdiction is possible, if ownership transference is not possible, and, if a workable option is not available.

A public notice was issued asking for input on the relocation site for the Hayden Hill fire tower. Responses were received by the public with the following alternatives being suggested in order of popularity.

A. Ash Creek Wildlife Area
B. Bieber Museum
C. Modoc County Fair Ground

The alternatives discussed as possible relocation sites are as follows:

A. Ash Creek Wildlife Area
B. Bieber Museum
C. Modoc County Fair Ground
D. USFS, Adin, California

These sites are discussed in more detail in Section 4.3.6; Fire Tower Alternative.

If the ownership can be transferred, the fire tower may be reconstructed at the Ash Creek Wildlife Area, the Bieber Museum or the Modoc County Fairgrounds. The USFS site in Adin would be considered if the former alternatives were not viable due to land acquisition or fire and safety codes. At the time of this writing it has been decided to reconstruct the fire tower at the Bieber Museum.

2.3.1.7 Enclosed Cyanide System Alternatives

To address potential avian and wildlife mortality associated with the open ponds of cyanide bearing solution at the heap leach facility, conceptual designs for covering the pregnant pond and containing the cyanide solution in tanks are being considered as alternatives. In the Proposed Action these ponds are covered with netting and fenced with chain link fencing to prevent wildlife and avian access. Two general concepts of totally enclosing the process solutions are presented as alternatives below.

Floating Cover

In an enclosed cyanide system alternative, utilizing floating covers, the cyanide solution would be held in lined ponds protected by floating covers. The covered ponds would be sized to contain the run-off from a 1,000-year, 24-hour storm event from the heap leach pad.

Channeling of solution from the pad to the ponds, processing facilities and back to the pad would be similar to the Proposed Action utilizing a system of closed pipes in lined ditches. The only exposed process solution which would exist with this alternative is the spray deployment system at the heap leach pad. Initial installation, maintenance and replacement costs are higher for floating covers than netting.

Process Solution Tanks

In this alternative, the process solutions would be contained in steel tanks. The tanks would be free standing in an excavated area below grade to allow for gravity flow of solutions (Figure 2.3-2). The tanks would be sized to contain the estimated process liquid volumes with sufficient freeboard, and placed in a bermed area large enough to contain 110 percent of the tank volume in the event of a spill. The foundation below the tank would be compacted fill or concrete. The membranes for leak collection and detection would be joined to the circumference of the tank or to the edge of the berm.

Precipitation run-off from the heap leach pad area would be contained in a lined pond sized for a 1,000-year, 24-hour storm event. This pond would be covered with netting or a floating cover, similar to the Floating Cover Alternative, to prevent wildlife access.

Solution would be routed from the pad to the tanks, process facilities, and back to the pad through piping as with the Proposed Action. The tank system would eliminate open sources of process solution except for the spray and drip deployment system at the heap leach pad.

The additional excavated area required for this alternative would be approximately 2.5 more acres than the Proposed Action. The capital cost of the Project would be significantly increased if this alternative were implemented.

2.3.2 Summary of Environmental Impacts

Table I, included in the summary section of this document, presents a summary comparison of the potential effects of the Proposed Action and alternatives. A summary of the unavoidable impacts of the Proposed Action and alternatives after mitigation is presented in Section 4.1.3.

2.3.3 Alternatives Eliminated from Further Consideration

This section briefly describes alternative concepts to the Proposed Action generated during the preliminary Project design phase or early EIR/EIS preparation which have been eliminated from further consideration. Agency concerns and public comments received in response to the Notice of Preparation (Lassen County Planning Department) identified the need for the EIR/EIS to include a description of those Project alternatives which have been eliminated from further consideration. This section describes the eliminated alternatives, documents their consideration, and presents the rationale for their elimination. The NEPA and CEQA regulations do not require those alternatives eliminated early in the EIR/EIS process be included in the detailed impact analysis. For this reason, the alternatives presented below, which were eliminated from consideration early in the EIR/EIS process, have not been analyzed in detail for potential impacts to the environment and are not included in Chapter 4.0 (Environmental Consequences) of this document. However, initial discussions have been included to inform the reader of the various alternatives originally considered. The alternatives eliminated from further study are summarized in Table 2.3-2.

TABLE 2.3-2

SUMMARY OF ALTERNATIVES ELIMINATED FROM FURTHER STUDY

ELIMINATED ALTERNATIVE	MAJOR REASON(S) FOR ELIMINATION
Project Location Alternatives:	
Different Location for Open Pit	Location of gold deposit is fixed.
Waste Rock Dump	
• Off-Site	Environmental, technical, logistical, and economic infeasibilities.
• Lower Gradient	Environmental, logistical, technological, and economic infeasibilities.
• Multiple Waste Rock Dumps	Additional land disturbance.
Different Locations for Tailings Impoundment	Environmentally sensitive locations; technically unsuitable; increased haul distances; land acquisition; economically infeasible.
Off-Site Processing Facilities	Increased haul distance; expanded Project area; economically infeasible; land ownership.
Facilities Location Alternative 1	Difficulties of containment causing increased potential for groundwater contamination due to existence of columnar jointed rock subgrade; longer haul distances; undesirable design.
Facilities Location Alternative 2	Difficulties of containment causing increased potential for groundwater contamination due to existence of columnar jointed rock subgrade; longer haul distances; undesirable design.
Facilities Location Alternatives 4 and 5	The least logistically and economically favorable wetlands avoidance alternatives.
Design Alternatives:	
Underground Mine	Technologically and economically infeasible.
Heap Leach Facility	
• Reusable Pad	Increased hauling requirements; increased impact to environment due to increased dump size and leached ore storage.
• Valley Leach	No topographically suitable location.
• Open Solution Collection Ditches	Easy access by wildlife.
Valley Fill Tailings Disposal	Environmental sensitivity; technological and economic infeasibility. No topographically suitable location; increased haul distance and related environmental impacts.

TABLE 2.3-2 (continued)

SUMMARY OF ALTERNATIVES ELIMINATED FROM FURTHER STUDY

ELIMINATED ALTERNATIVE	MAJOR REASON(S) FOR ELIMINATION
Reduced Project Size	Economically infeasible.
Enlarged Project Size	Economically infeasible due to current worth of precious metals.
Processing Alternatives:	
Slower Processing Rate	Longer term environmental impacts; economically infeasible.
Faster Processing Rate	Increased environmental impacts; economically infeasible.
Lixiviant Alternative	Increased environmental impacts; unproven technology; lower metal recovery; toxicity.
Vat Leaching	Ore characteristics not amenable; technically infeasible; economically infeasible.
All Heap Leaching	Ore characteristics not amenable; technically and economically infeasible.
All Milling	Ore characteristics not amenable; technically infeasible.
Seasonal Operations	Logistically difficult; transient workforce.
Ancillary Facilities:	
Access Road Alternatives	Increased environmental impacts; economically infeasible; land and ROW acquisition.
On-Site Power Generation	Increased environmental impacts primarily due to emissions, noise, and potential impact due to increased fuel storage; higher fossil fuel consumption.
Preston Canyon Power Supply Route	Feasibility of LGMI owning power line outweighs beneficial aspects of this alternative.
Federal Land Routed Power Line Supply	Feasibility of LGMI owning power line outweighs beneficial aspects of this alternative.
Off-Site Process Water Supply (hauled in by truck)	Quantity required would cause undesirable impacts to environment due to greatly increased water truck traffic. Impractical logistics.
On-Site Company Housing:	Increased environmental impacts; economically and socioeconomically infeasible; land acquisition.
Transportation to Site Utilizing Only Private Vehicles:	Increased daily trips; associated increased environmental impacts; higher fuel consumption.

TABLE 2.3-2 (continued)

SUMMARY OF ALTERNATIVES ELIMINATED FROM FURTHER STUDY

ELIMINATED ALTERNATIVE	MAJOR REASON(S) FOR ELIMINATION
Fire Tower Alternatives:	
New Fire Lookout Site Locations	
• No Replacement	Reduction of lookout coverage; reduction of efficiency of existing lookouts. High probability of major fire events developing before sighting.
• Lava Peak	Priority view sites not visible; overlap with other existing sites.
• Spring Hill	Presence of old growth forest; lack of access; poor viewshed area.
• Boyd Hill	Inability to meet performance criterion; poor performance record.
• Bald Mountain	Longer access road requirements; existence of cultural sites.

2.3.3.1 Component Location Alternatives

Locations of the facilities associated with the Project have been chosen to minimize the area to be disturbed, avoid known cultural and historic resources and maximize efficiency and economics. Possible locations for Project components considered but eliminated from further consideration early in the design process, are described below.

Open Pit Location

The location of the Hayden Hill gold deposit is fixed. The pit location is functionally tied to the mineralized area, and could not be altered and still accomplish the Project objective of removing the precious metals from this deposit. The pit is designed to remove as little waste rock as possible and only process ore which is economically feasible. Therefore, no feasible alternatives for pit locations exist, and no pit location alternatives are considered in this section.

Waste Rock Dump

Off-Site: An alternative location for the waste rock dump is off-site. Off-site disposal of waste rock was eliminated from further consideration because it would involve off-site use of haul trucks with an increase in transportation costs and corresponding increases in fuel consumption and pollutant emissions. A comparable area of land would be required and would be impacted, although possibly to a different degree or in a different manner. The additional land would have to be acquired. This alternative was dismissed due to apparent unfavorable environmental, technical, logistical and economic considerations.

Lower Topographic Gradient: Areas of lower topographic gradient for the waste rock dump were considered. Two flatter locations were identified in the vicinity of the mine. A portion of one of the areas covers Snyder Waterhole, a manmade pond and wetlands, thus making this site unattractive as an alternative. Waste rock dumps in either of these alternative areas would require hauling the waste rock an additional one to three miles from the mine, thus increasing the fuel consumption and emissions. In addition, not all of the ground is controlled by the Applicant, necessitating acquisition of land. The cost of acquiring the land, as well as increased hauling distance and costs, make these options unattractive. Both of these alternatives have been eliminated from further consideration due to their environmental, logistical, technological and economic infeasibilities.

Multiple Waste Rock Dumps: The original POO included two waste rock dumps constructed on two opposing sides of Hayden Hill. Through the EIR/EIS process the two dumps were consolidated to minimize disturbance and overall environmental impact.

Tailings Impoundment

Prior to selecting the proposed site for the tailings impoundment, fourteen alternate sites were investigated by the Applicant (Welsh 1989b). Of these, eleven sites were eliminated based upon a combination of reasons including the following:

1) Environmentally sensitive location;
2) Unfavorable land status;
3) Technologically infeasible;
4) Logistical infeasibility; and
5) Economically unfavorable.

Both advantages and disadvantages of each alternative were considered prior to elimination as shown on Table 2.3-3.

Processing Facilities

An off-site location for processing facilities, including the heap leach pad, ore preparation, mill, and gold recovery facilities, was eliminated from further consideration. Although such a site could possibly be found which would be closer to needed utilities, with better topographic and environmental characteristics, the site would be removed from the mine area. Processing would therefore involve direct bulk shipment of unprocessed ore to the processing facility. This alternative was eliminated from additional consideration due to environmental, technical, logistical, legal and economic considerations.

Facilities Location Alternatives

Various facilities arrangement configurations were studied during the design stage of planning. Since altering one component of the facility affects the location of the other components, differing arrangements were grouped into viable working units for comparison. Two alternatives which appeared economically viable were delineated in the early phases of the Project and were designated as Facilities Location Alternatives 1 and 2. Alternatives 1 and 2 were eliminated from further consideration due to surface and subsurface conditions which make these areas unsuitable for containment and construction. The areas are underlain by basalt flows which are fractured by columnar jointing making containment and groundwater contamination protection more difficult and hazardous. Basalt outcrops are evident in several places within this area. The difficulty in constructing facilities in solid rock was also a consideration. Potential increases in adverse impacts to Snyder Waterhole, an increase in haul distances and an increase in total disturbance area were also factors in eliminating these alternatives from further study.

TABLE 2.3-3

TAILINGS LOCATION ALTERNATIVES ELIMINATED FROM FURTHER STUDY

Site	Advantages	Disadvantages
1-P	Shortest transport distance, impervious natural foundation, low water diversion costs	High embankment volume
2-C	Short transport distance, low water diversion costs	Land acquisition required
3-E	None identified	Moderate transport distance, steep topography, high embankment volume
4-E	Short transport distance	Rugged topography, large watershed above, pervious foundation
5-E	Low embankment volume	Long transport distance, large liner area, tailings have to be pumped
6-E	Low embankment volume	Long transport distance, large liner area, tailings have to be pumped
7-E	Low development costs	Long transport distance, road crossings, pervious foundation
8-E	Low development costs	Moderate transport distance, steep topography, pervious foundation
9-E	Low embankment volume	Long transport distance, wetlands impact, large lined surface, tailings must be pumped
10-E	None identified	Longest transport distance, large watershed, road crossings, high development costs
11-E	None identified	Long transport distance, large watershed, small road closure
12-C	Short transport distance, impervious foundation, deep groundwater, sparse vegetation	Acquisition required, need to pump tailings
13-E	Second shortest transport distance, sparse vegetation	Acquisition required, large liner area, rough surface terrain
14-E	Short transport distance, sparse vegetation	High embankment volume

Two other facilities location alternatives are identified as Facilities Location Alternatives 4 and 5. These alternatives are re-configurations of the heap leach pad to avoid wetland areas in the vicinity of the heap. Facilities Location Alternative 3 was considered to be the most feasible, logistically compelling, environmentally acceptable, and functional alternative. For this reason it was considered in detail in Section 2.3.1. Alternatives 4 and 5 cover less area by stacking ore higher on the heap. The increased height represents additional impacts to visual resources as well as creating more difficulty for reclamation. These alternative designs also present more difficulty for operations and logistics. Alternatives 4 and 5 were eliminated for these reasons.

2.3.3.2 Design Alternatives

Several alternatives for mining the Hayden Hill deposit were generated early in the planning and feasibility stages of the Project. Several of those which were conceptual design alternatives are briefly described below.

Mine Design

The only mine design alternative eliminated from further consideration was underground mining. Underground mining is for deep, high grade ores occurring in discrete, structural zones such as veins and pipes. The ore deposit at Hayden Hill is a relatively shallow, disseminated, precious metals occurrence amenable to bulk mining methods. For this reason, underground mining is not technologically or economically feasible for the Project and was eliminated from additional consideration.

Heap Leach Facility

Basic Design: Heap leach processing facilities typically utilize one or more of the following design methods:

1) A reusable pad;
2) A valley leach; or,
3) A permanent expanding pad.

Prior to selecting the proposed permanent expanding pad design for the Project, the other two alternative designs were examined.

The reusable pad method involves the cyclic loading, leaching, rinsing (detoxification) and unloading of the ore from a durable pad. This method is most appropriate for ores which leach quickly, predictably and uniformly. The Project ore requires multiple leach cycles for optimum metal recovery. The reusable pad method, which requires additional handling of ore, was considered to be inappropriate for the Project due to the potential for increased environmental impacts on wildlife, air quality, and noise which the increased handling would create, and because the unloaded leach material would be disposed of in a less controlled environment than the permanent pad. The added expense involved in handling the ore twice and logistical difficulties associated with loading and unloading the ore on a regular basis were also considered.

The valley leach method is used only when valley or sloped sites are available. This method involves the construction of an ore retaining structure at the toe of the pad in a valley or on sloping ground, allowing progressive loading of ore behind the structure. This method is applicable in a limited number of topographic settings and was eliminated from further study because there were no suitable sites in the Project area.

Open Solution Collection Ditches

The Proposed Action originally included using open ditches for process solution routing. Through the EIR/EIS process the Applicant decided to change the Proposed Action to a system of pipes laid within lined ditches. The primary reason for eliminating this alternative was protection of wildlife species, because access to the solution would be much more difficult with the pipe system. The alternative of open solution collection ditches was, therefore, considered and eliminated from further study for environmental reasons.

Tailings Disposal

An alternate tailings impoundment design considered in the early planning stages was a valley fill. A valley fill tailings disposal site is constructed utilizing a retaining structure across a valley with tailings being deposited behind this structure. This type of impoundment, however, was eliminated because the few suitable areas within the vicinity of the mine either were more environmentally sensitive than the proposed site, or were technologically and economically infeasible because of long transport or pumping distances from the mill complex.

Reduced Project Size

An alternative to reduce the size of the Project was considered in the early planning stages. In this alternative the total tons of ore and waste rock proposed to be mined over the life of the mine would be decreased by 50 percent.

As proposed, the Project is designed to mine the ore body from one pit. If the scope of the Project was reduced by 50 percent, the reduction in ore and waste rock volumes mined would reduce the Project life from approximately 8 years to approximately 4 years, assuming a rate of production similar to the proposed rate. Although the overall size of the Project would be reduced, personnel requirements would remain approximately the same since similar facilities would be required for mining, processing, and recovering gold from the ore.

Reducing the Project size would disturb slightly less land than the Proposed Action. This acreage reduction would be primarily due to elimination of portions of the pit, a reduced waste rock dump area, and elimination of some of the heap leach pad and tailings impoundment areas. Project facilities and mine equipment requirements would remain the same as for the Proposed Action.

Because the Project capacity and rate of production would not change with this alternative, ancillary facilities would not be reduced in size or capacity. Total consumption, however, would be about one-half of that required for the Proposed Action as less ore would be processed and the time of operation would be shortened.

Shortened mine life would result in decreased environmental effects in the Hayden Hill area due to slight decreases in the amount of disturbed acreage, slightly decreased demand on natural resources including minerals, water, and power, decreased traffic and noise impacts to wildlife, and slightly reduced visual impacts. This alternative would also shorten the positive economic benefit to Lassen and Modoc Counties and the associated communities.

Developing only half of the ore body would render this Project economically infeasible, because the greatly reduced gold production would be insufficient to pay back exploration and acquisition costs, and the capital investment would be difficult to justify. Should mine life be extended to that in the Proposed Action, a somewhat smaller capital investment would be required, but mining at half the proposed rate would reduce economies of scale both in mining and milling the ore. In either case, the economic feasibility of the Project would be severely impaired.

Enlarged Project Size

Enlarging the Project was considered in detail during the initial planning stages. The enlargement plan considered would increase the scope of the Project by 50 percent.

The increase in ore and waste rock volumes mined would increase the Project life from approximately 8 years to approximately 12 years, assuming a similar production rate to the Proposed Action. It is estimated that personnel requirements would be similar to the Proposed Action. In this alternative, the ore body would be mined in a pit or pits extended deeper than those proposed. The ore would be processed as in the Proposed Action.

The enlarged Project would disturb slightly more land surface than the Proposed Action. The heap leach pad and tailings impoundment would be stacked higher to accommodate much of the additional ore. Most of the increase in the amount of surface disturbance would be due to the increase in waste rock storage area, the dump would be extended vertically so that additional disturbances would be minimized.

The rate of production and ancillary facilities would not differ from those of the Proposed Action. Total consumption, however, would be about 1.5 times that required for the Proposed Action due to the extended time frame.

The lengthened mine life would result in increased environmental effects in the Hayden Hill area due to increases in the amount of disturbed acreage, overall increased demand on natural resources including minerals, water, and power, prolonged traffic and noise impacts to wildlife, and increased visual impacts over a longer period of time. The alternative would have a positive effect on local and regional economies.

2.3.3.3 Processing Alternatives

This section describes processing alternatives to the Proposed Action considered in the planning stages and subsequently eliminated from further consideration. The Proposed Action assumes an annual production rate of approximately 1.3-mt of millable material and 4.7-mt of heap leach material, or 20,000-tons per day (tpd) of ore, with an active mine life of approximately 8 years. The proposed processing method for the Project is to heap leach the lower grade ore and mill the higher grade ore. During the early planning and metallurgical testing phases of the Project several alternative methods of processing the ore were considered: vat leaching, heap leaching all of the ore, milling all of the ore and alternate lixiviants. The following sections briefly describe why these processing alternatives have been eliminated from further study. Other alternatives required decreasing or increasing the planned ore processing rate resulting in either a slower or faster Project operating rate. The processing rate alternatives included a 50 percent reduction and a 50 percent increase in rate. Also considered was a seasonal operations alternative. In all of the processing alternatives, the total tons of ore and waste rock mined would be identical to the Proposed Action. The Project facilities locations and designs would not change with the possible exception of the processing facility which could be somewhat smaller with the reduced production rate alternative. The total disturbed acreage due to the Project would generally remain the same as the Proposed Action. However, the duration of activities and total consumptive uses associated with Project operation would differ.

Slower Processing Rate

A 50 percent slower rate of processing, 10,000 tpd would increase the Project life to about 16 years. The processing rate could be reduced in one of two ways:

1) Operate fewer days per week, and shorter days; or
2) Process less ore per hour per day.

The second alternative would result in a smaller processing facility with the crusher operating at an average rate of 600-tons per hour. A smaller capacity mill than the proposed 3,500-tpd unit could be employed. It is estimated that personnel requirements would be reduced.

Because the same total amount of ore and waste rock would be processed as for the Proposed Action, the site plan generally would be identical, (Figure 2.2-1). A smaller processing plant would be in the same location but would disturb a few less acres.

Water requirements for ore processing would decrease on an average daily basis, but would increase overall due to the extended Project duration. The increase would be due to greater amounts being needed for dust control and make-up water to compensate for that lost due to evaporation. It is estimated that average daily water consumption would decrease from 1,000 gpm to 650 gpm. However, more water would be consumed over the life of the Project than for the Proposed Action. Due to a lower instantaneous demand for water, it might be possible to reduce the number of wells, depending on the production capacity of the developed wells.

The major consumption of power is related to the number of tons of ore processed; the fewer tons processed per hour, the fewer kilowatts consumed. Ancillary facilities, which consume power regardless of how much ore is processed per hour, represent minor consumption. Average daily power consumption would be reduced by an estimated 35 percent, compared to the Proposed Action. Overall power consumption would be increased due to longer Project life.

If less ore is processed per hour, possible reductions in mine and processing equipment would include:

- **Mining:** Mining operations would be six days per week, two shifts per day. Equipment requirements would be reduced, primarily in loaders and haul trucks. Most other support equipment would still be necessary.

- **Crushing:** Crushing rates would decrease from 1,200 to 600-tons per hour. Equipment capacities could be reduced.

- **Milling:** Milling rates would decrease from 3,500 tpd to 1,750 tpd. Equipment capacities could be reduced.

- **Processing:** Although gold leaching and recovery rates would remain the same, a slightly smaller processing facility area could be utilized due to the decrease in the volume of material being processed at one time.

Access requirements would be similar to the Proposed Action. Project traffic would be marginally lower than estimated for the Proposed Action. The number of bus/van pool trips would be slightly reduced based upon the reduction of workers per shift for each of the two scheduled shifts. The duration of traffic impacts would be extended to the 16-year mine life.

The alternative of slowing the Project's production rate was eliminated from further study because it is inefficient and would extend the impacts to all areas of concern associated with the Project. The total consumption of water would be increased, impacts to the air as a result of dust and vehicle emissions would be prolonged, visual impacts would remain for a longer period of time and various Project components would have to be sized at less than optimum capacity to be efficient.

Faster Processing Rate

A 50 percent faster rate of processing would decrease the Project life to about 6 years and increase processing rates to approximately 30,000 tpd. The processing rate would be increased primarily by adding mining equipment and personnel. A larger processing facility would include a crusher operating at 1800-tons per hour. A mill, larger than the proposed 3,500 tpd unit, would be employed. It is estimated that personnel requirements would be increased by more than 30 percent.

Because the same total amount of ore and waste rock would be processed as for the Proposed Action, the site plan would be identical (Figure 2.2-1), with the exception of a larger processing plant. The larger processing plant would be in the same location but would disturb additional acres.

Water requirements for ore processing would increase on a daily basis, but would decrease overall due to the reduced Project duration. It is estimated that average daily water consumption would increase from 1,000 gpm to 1,900 gpm. Approximately 30 percent more water would be used over the Proposed Action over the life of the Project. Due to a higher instantaneous demand for water, it may be necessary to increase the number of wells. Daily power consumption would be increased by an estimated 85 percent compared to the Proposed Action.

Anticipated increases in mine and processing equipment would include:

- **Mining:** Mining operations would remain at six days per week and two shifts per day. Equipment requirements would increase (primarily loaders and haul trucks) due to the increased production requirements. Most other support equipment would remain unchanged.

- **Crushing:** Crushing rates would increase from 1,200 to 1,800-tons per hour. Equipment capacities would be increased.

- **Milling:** Milling rates would increase from 3,500 tpd to 5,250 tpd. Equipment capacities would be increased.

- **Processing:** Although gold leaching and recovery rates would remain the same, a much larger processing facility area would be required due to the increase in the volume of material being processed at one time.

Access requirements would be similar to the Proposed Action. Project traffic would be marginally higher than estimated for the Proposed Action. The number of bus/van pool trips would be increased based upon the increase of workers per shift for each of the two scheduled shifts. The duration of traffic would be reduced to the 6-year mine life.

The faster processing rate alternative was eliminated from further study during the planning stages because it is inefficient and enlarges the Project's inherent impacts. Negative impacts would include development of additional water sources, increased traffic, more land disturbance, and a greater number of employees hired for a shorter period of time.

Lixiviant Alternative

The use of thiourea was considered as an alternative to sodium cyanide for heap leaching at Hayden Hill. The following paragraphs discuss the reasons this alternative was not considered desirable.

Thiourea is often represented as being non-toxic, however, it is toxic but much larger amounts must be ingested compared to cyanide. Thiourea is a known carcinogen listed by California Proposition 65 and by Occupational Safety and Health Association (OSHA). Cyanide is not considered a carcinogen by the same organizations. Thiourea also affects the availability of iodine for use in the bodies of humans and animals. This is a persistent effect. In comparison, cyanide is not a persistent nor cumulative poison.

Cyanide has been used in mining for over 100 years. Mining personnel understand and respect its toxicity. Effective antidotes for cyanide poisoning are available and will be on site. If thiourea were used instead of cyanide, careful health and safety procedures and wildlife exclusion methods would still have to be used due to its toxicity.

Thiourea leaching must be done under acid conditions (pH 1 to 3). If used at Hayden Hill, the leach and CIP circuits would have to be constructed from acid-resistent materials. This would triple the cost of these facilities, resulting in additional capital costs. More truck loads of acid would have to be delivered to the site, and large quantities of lime would still be required to neutralize the mill tails and heap.

Thiourea consumptions are high, generally 4 lbs/ton of ore compared to 1 to 2 lbs/ton of ore of cyanide. Thiourea is not suited to ores with clays and the Hayden Hill ores contain significant amounts of clays.

Clays adsorb thiourea causing greater reagent consumption and cost, and lower metal recovery. The high consumption rate of thiourea would require double the amount of trucks delivering the reagent to the Project site, and a significantly higher operating cost per ton.

In addition, the use of thiourea as a lixiviant for heap leaching is unproven technology for the mining industry. The use of thiourea at Hayden Hill would require additional deliveries of acid and thiourea by truck, increasing energy consumption and impacts to transportation and air quality. In addition, the extra truck deliveries would increase the chance of a toxic spill on the access road or highways to the Project site. Increased environmental impacts, unproven technology, lower metal recovery, and its toxicity make the use of thiourea at Hayden Hill undesirable.

Vat Leaching

Vat leaching is a processing technique suitable for certain types of ore with a narrow range of metallurgical characteristics. Generally speaking, vat leaching is only appropriate for ores which have a predictable leaching cycle and which leach very quickly (i.e., within several days to one week). The physical and metallurgical characteristics of the Hayden Hill ore are not amenable to vat leach techniques because the ore does not leach rapidly enough to make vat leaching technically feasible. This alternative was eliminated from detailed study.

All Heap Leaching

The Project was originally viewed as a large tonnage low grade ore heap leach operation. Initial testing, however, showed that milling might be a suitable technique for some of the ore. Advanced metallurgical testing showed that substantial amounts of gold would not be recovered without milling some types of the ore. Heap leaching all of the ore with no milling was ruled out as being technologically and economically infeasible. A significant amount of the mineral resource would be wasted using this alternative.

All Milling

Milling all of the ore, with no heap leaching, represents another alternative. Milling processes are relatively cost intensive compared to heap leaching. Higher grade ore which responds favorably to this treatment yields enough gold to make the additional processing feasible. However, milling of lower grade ores at Hayden Hill, which exhibit good recoveries with heap leaching, proved to be economically infeasible.

Seasonal Operations

Suspending operations during winter is an alternative which was considered during the planning stages of the Project. This alternative was eliminated because of logistical problems and infeasibility of closing a mine, laying off employees and maintaining security during the suspension periods. Seasonal suspension leads to a transient work force which can result in socioeconomic problems for the surrounding communities. The potential increases in efficiency were not anticipated to out weigh the logistical and socioeconomic problems of seasonal operation.

2.3.3.4 Ancillary Facilities

Various alternatives were considered for the access road, power supply, and water supply during the early stages of planning. Those alternatives eliminated from further study are briefly described below.

Access Road

Five alternative road alignments, between the mine and Highway 139, were considered. Three of these alignments would require major road building efforts, and would disturb more land than the proposed alignment, which improves existing roads. Additional acquisitions of land would be required for these alignments. The remaining two alignments were eliminated from further study due to the increased impacts on the environment, the unfavorable land status, and the substantial construction costs.

Power Supply Alternatives

Power Generation: On-site power generation was an alternative for the Project. Although this option would alleviate the need for constructing power lines, the noise, potential air emissions, and increased fuel storage that would occur using generators would constitute unnecessary additional environmental impacts.

Power Supply Routes: Alternate routes for power lines were considered early in the planning stages. However, the additional land acquisition and disturbance required for alternate ROWs were considered to be less efficient, less cost effective, and more environmentally damaging than following access roads into the site. For these reasons, the power line routes proposed for the site run along the access road until they reach the proposed Project boundary.

Alternative routes for the power supply into the Project included a routing through Preston Canyon and a routing which utilized as much Federal land as possible. These alternatives were considered before it was determined LGMI could own the line and thus, remove the growth inducing impact of the new power supply. Both alternative routings would require clearing newly obtained ROWs, long circuitous routings along existing roadways and all new construction for an increased distance. These alternatives were considered and eliminated in light of the possibility of a line which could be owned and removed at the time of mine closure.

Water Supply Alternatives

Trucking water from another location to the Project site was considered as an alternative in the early planning stages. This alternative was not considered practical enough to warrant detailed consideration given the volumes of water required for the Project. The proposed operation will require up to 1,000 gpm. A typical large water truck has a tank capacity of 8,000 to 10,000 gallons, requiring multiple trips hourly or large storage facilities on-site.

2.3.3.5 Housing Alternatives

The option of on-site housing provided by LGMI was eliminated from further consideration. Unless a mine site is extremely remote, employees typically prefer to live in communities with existing infrastructures including public services, housing, employment for other family members, etc. If employees were to live at the Project site, the area would suffer much more severe environmental impacts. Housing employees at the site is environmentally, legally (not zoned for public housing), and economically undesirable.

2.3.3.6 Transportation

Since workers likely will be commuting from a variety of places, including Alturas, Susanville, and possibly Redding, the workers could provide their own transportation to and from the Project using individual vehicles as an alternative to the Proposed Action in which vans, and/or car pool services could be provided if demand is present. Use of private vehicles would result in increased daily traffic volumes on Hayden Hill Road from 13-20 average daily trips (ADT) estimated for the Proposed Action to 100 ADT. Traffic would increase significantly on Highway 139 as well. Energy consumption, road dust, air emissions, impacts to wildlife and traffic volume would increase with this alternative. Therefore, this alternative was eliminated in the planning stages.

2.3.3.7 Fire Tower Alternatives

New Fire Lookout Site Location
During an aerial reconnaissance of the area, five sites were selected as possible lookout alternatives by USFS and CDFFP personnel. These sites have been examined and are listed as alternatives eliminated from further study in the following discussion.

Some of these sites did not meet some of the basic criterion and were, thus, eliminated from detailed consideration. The rational for their dismissal are as follows:

Lava Peak - T34N, R10E, Section 7: This site is located 12 miles south of Hayden Hill at an elevation of 6,613 feet, on private land. Lava Peak was the site of a former lookout that was removed from services presumably because of the viewshed overlap with Fredonyer Peak lookout. The existing Fredonyer lookout overlooks much of the Lava Peak viewshed, and the Gerig Burn area, a priority view site, is not visible from this location. These two points are contrary to the Forest Management Objectives, thus this alternative was removed from consideration.

Spring Hill - T36N, R10E, Section 4: This alternative is located 2.5 miles southeast of Hayden Hill at an elevation of 6,452 feet. The selection of this site would impact a stand of old growth forest. Due to the relatively poor viewshed area, this alternative has been eliminated from consideration.

Boyd Hill - T36N, R8E, Section 4: This alternative is located approximately ten miles west of Hayden Hill at an elevation of 5,933 feet. Boyd Hill was the site of a previously destroyed lookout. The Boyd Hill lookout was removed from service due to a low first sighting rate; result of its viewshed overlap with the community of Bieber. The priority view sites, Silva Flat and the Gerig Burn, would not be visible from the Boyd Hill lookout site. Because of this inability to meet the lookout performance criterion and its poor performance record in the past, the Boyd Hill site has been removed from consideration.

Bald Mountain - T35N, R8E, Section 31: This site is located approximately 14 miles southwest of Hayden Hill at an elevation of 6,067 feet, in Modoc National Forest, Lassen County, California. Portions of the Gerig Burn and the Silva Flat area can be seen from the Bald Mountain site, there is some viewshed overlap with the Harvey Mountain lookout. A search of the Big Valley Ranger District's cultural resource files shows that Bald Mountain is recognized as a "Power Place" by Native American groups. New construction of access roads to the site would be longer than the proposed Snag Hill location. For these reasons, this alternative was removed from consideration.

2.4 Proposed Resource Plan

The Hayden Hill Resource Plan establishes goals, objectives, and policies to guide the development of mineral resources at Hayden Hill. The Resource Plan is described in Chapter 5.0.

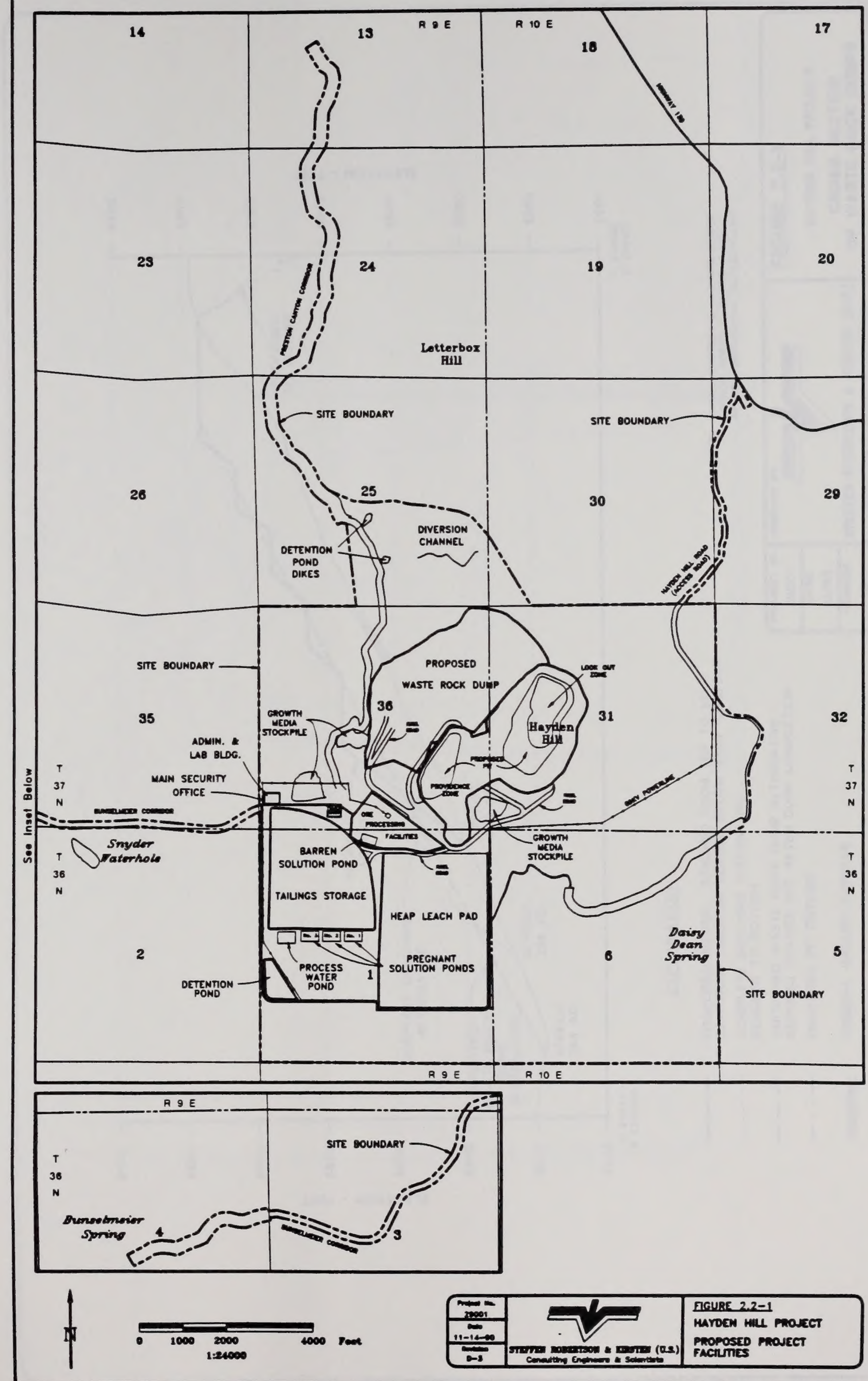

R 9 E
R 10 E
14
13
18
17
HIGHWAY 139
23
24
19
20
PRESTON CANYON CORRIDOR
Letterbox Hill
SITE BOUNDARY
SITE BOUNDARY
26
25
30
29
DETENTION POND DIKES
DIVERSION CHANNEL
HAYDEN HILL ROAD (ACCESS ROAD)
SITE BOUNDARY
PROPOSED WASTE ROCK DUMP
LOOK OUT ZONE
35
36
31
32
Hayden Hill
GROWTH MEDIA STOCKPILE
ADMIN. & LAB BLDG.
MAIN SECURITY OFFICE
PROPOSED PIT
PROVIDENCE ZONE
T 37 N
See Inset Below
BUNSELMEIER CORRIDOR
ORE PROCESSING FACILITIES
GROWTH MEDIA STOCKPILE
Snyder Waterhole
BARREN SOLUTION POND
T 36 N
TAILINGS STORAGE
HEAP LEACH PAD
Daisy Dean Spring
2
6
5
PREGNANT SOLUTION PONDS
PROCESS WATER POND
1
DETENTION POND
SITE BOUNDARY
R 9 E
R 10 E
R 9 E
SITE BOUNDARY
T 36 N
Bunselmeier Spring
4
3
BUNSELMEIER CORRIDOR
N
0
1000
2000
4000 Feet
1:24000

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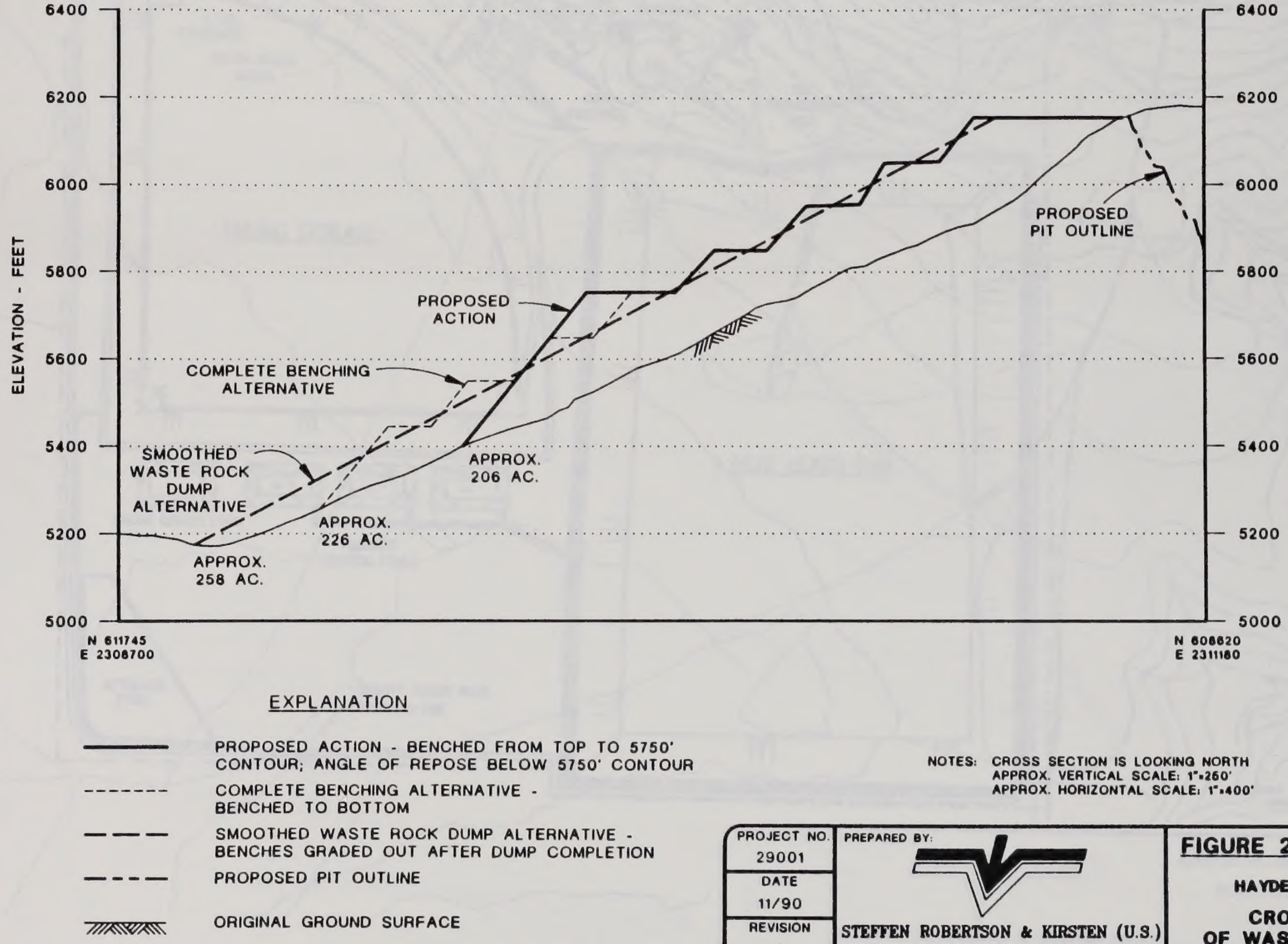
FIGURE 2.2-1
HAYDEN HILL PROJECT
PROPOSED PROJECT FACILITIES



NOTES: CROSS SECTION IS LOOKING NORTH
APPROX. VERTICAL SCALE: 1"=260'
APPROX. HORIZONTAL SCALE: 1"=400'

PROJECT NO. 29001	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	**FIGURE 2.2-2**
DATE 11/90		HAYDEN HILL PROJECT
REVISION 0		CROSS SECTION OF WASTE ROCK DUMPS

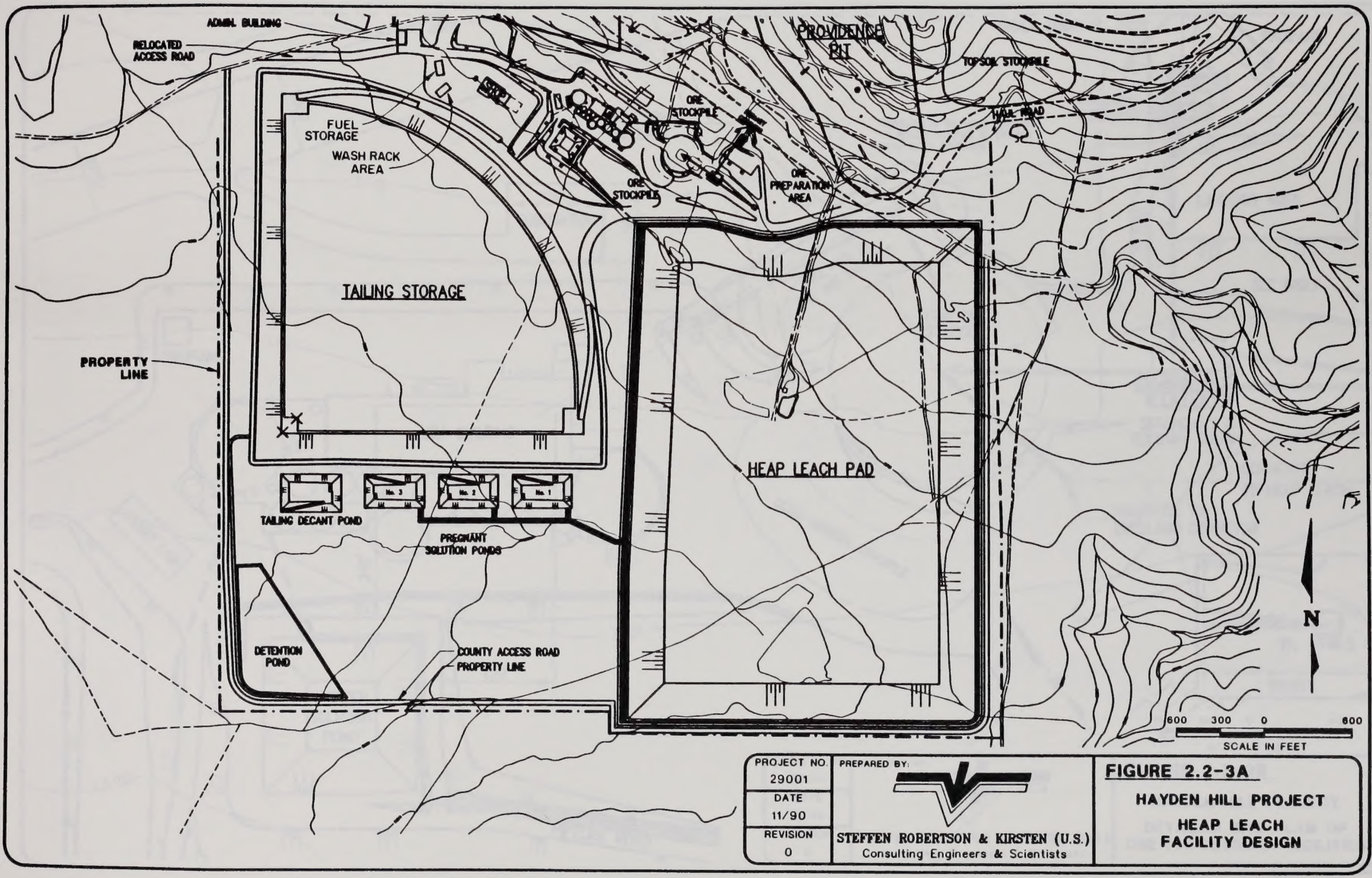

ADMIN. BUILDING
RELOCATED ACCESS ROAD
PROVIDENCE PIT
TOPSOIL STOCKPILE
HAUL ROAD
ORE STOCKPILE
FUEL STORAGE
WASH RACK AREA
ORE STOCKPILE
ORE PREPARATION AREA
TAILING STORAGE
PROPERTY LINE
HEAP LEACH PAD
No. 3
No. 2
No. 1
TAILING DECANT POND
PREGNANT SOLUTION PONDS
DETENTION POND
COUNTY ACCESS ROAD
PROPERTY LINE
N
600
300
0
600
SCALE IN FEET

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FIGURE 2.2-3A

HAYDEN HILL PROJECT

HEAP LEACH
FACILITY DESIGN

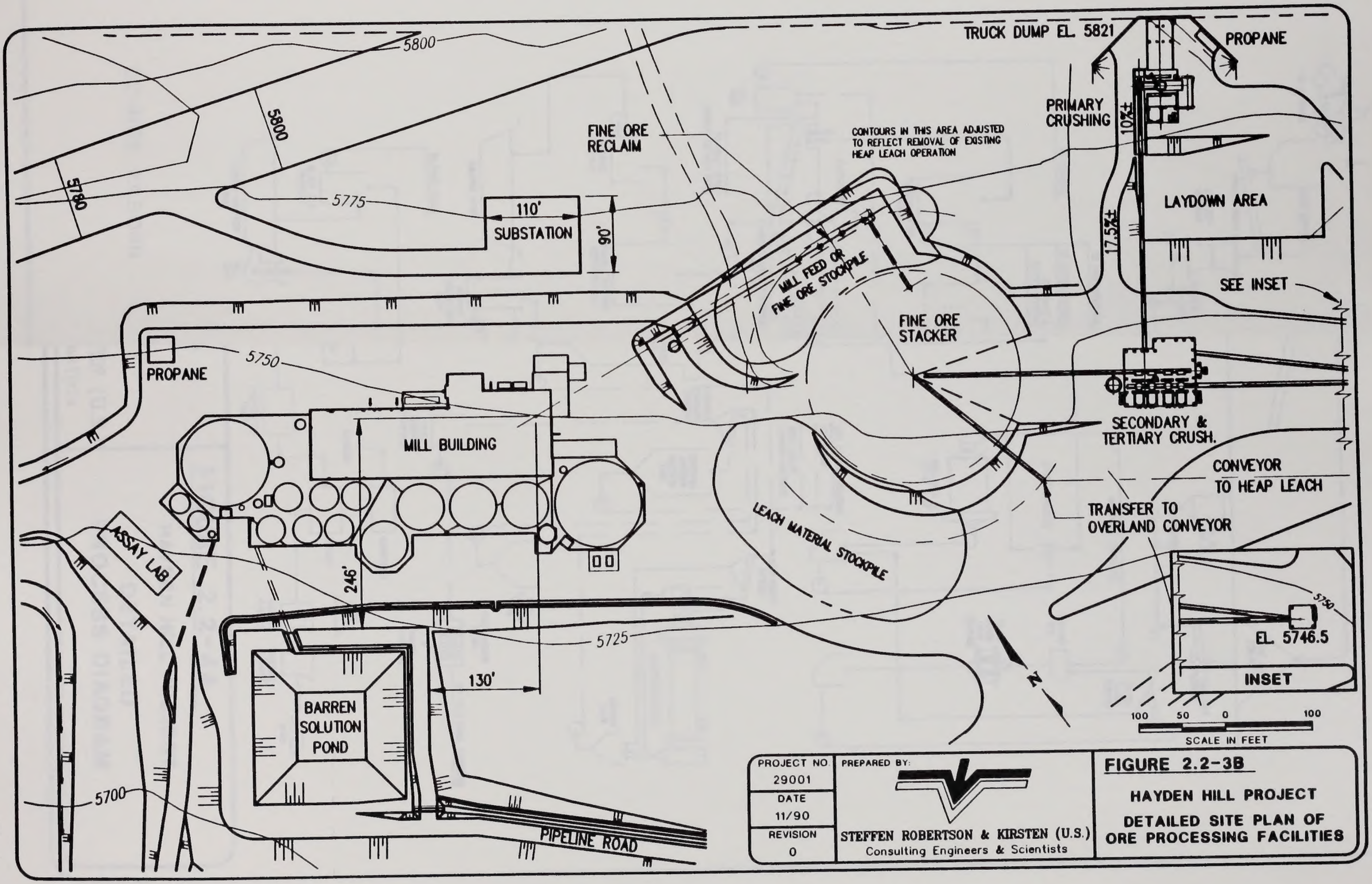
TRUCK DUMP EL. 5821
PROPANE
PRIMARY CRUSHING
10%±
17.5%±
LAYDOWN AREA
SEE INSET
FINE ORE RECLAIM
CONTOURS IN THIS AREA ADJUSTED TO REFLECT REMOVAL OF EXISTING HEAP LEACH OPERATION
5800
5800
5780
5775
110'
SUBSTATION
90'
MILL FEED OR FINE ORE STOCKPILE
FINE ORE STACKER
SECONDARY & TERTIARY CRUSH.
CONVEYOR TO HEAP LEACH
TRANSFER TO OVERLAND CONVEYOR
PROPANE
5750
MILL BUILDING
LEACH MATERIAL STOCKPILE
ASSAY LAB
246'
5725
130'
BARREN SOLUTION POND
5700
PIPELINE ROAD
N
5750
EL. 5746.5
INSET
100 50 0 100
SCALE IN FEET

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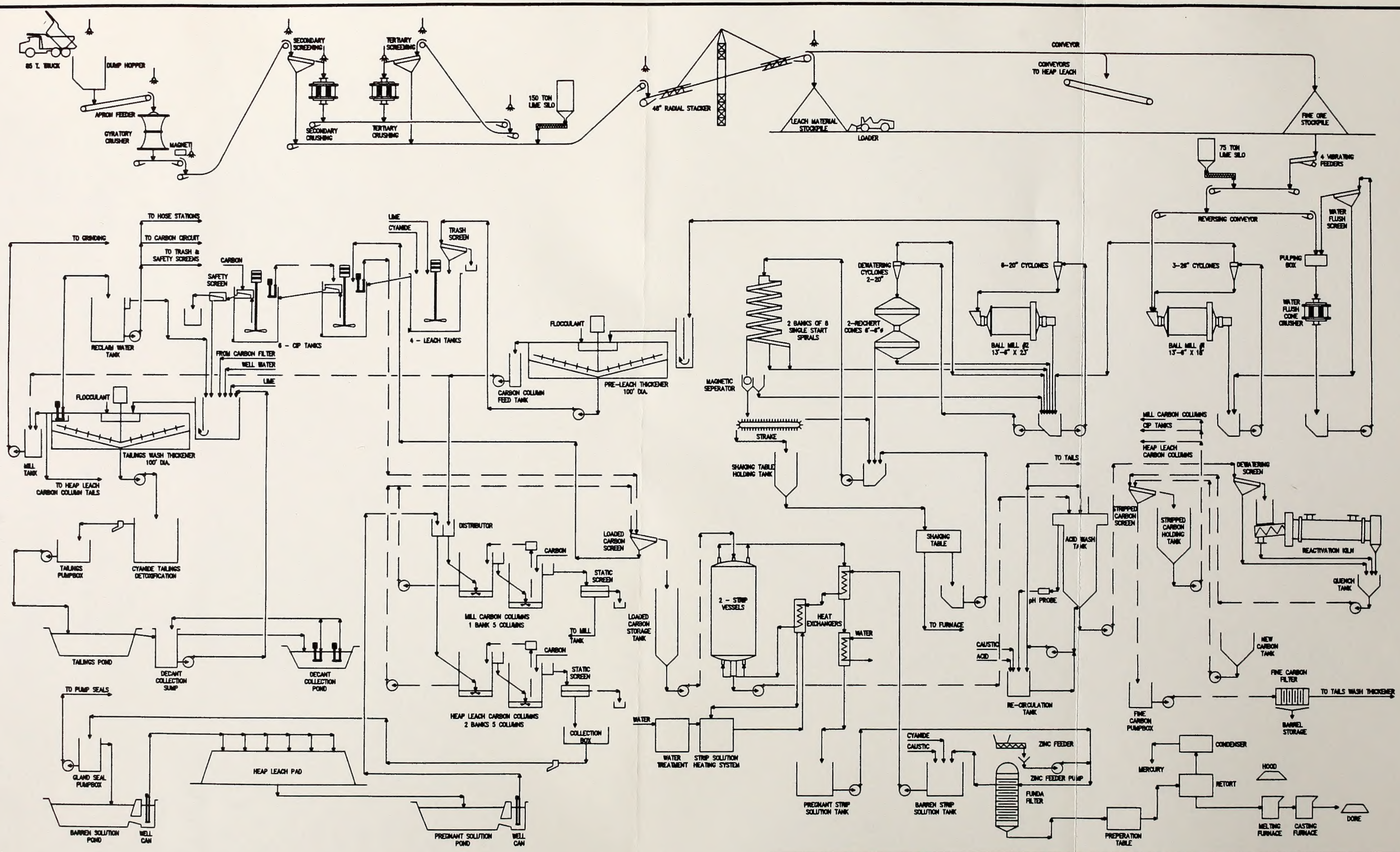
FIGURE 2.2-3B

HAYDEN HILL PROJECT

DETAILED SITE PLAN OF ORE PROCESSING FACILITIES


85 T. TRUCK
DUMP HOPPER
APRON FEEDER
GYRATORY CRUSHER
MAGNET
SECONDARY SCREENING
TERTIARY SCREENING
SECONDARY CRUSHING
TERTIARY CRUSHING
150 TON LIME SILO
48" RADIAL STACKER
CONVEYOR
CONVEYORS TO HEAP LEACH
LEACH MATERIAL STOCKPILE
LOADER
FINE ORE STOCKPILE
75 TON LIME SILO
4 VIBRATING FEEDERS
REVERSING CONVEYOR
WATER FLUSH SCREEN
PULPING BOX
WATER FLUSH CONE CRUSHER
3-26" CYCLONES
BALL MILL #1 13'-6" X 18'
6-20" CYCLONES
BALL MILL #2 13'-6" X 23'
DEWATERING CYCLONES 2-20"
2-REICHERT CONES 6'-6"ø
2 BANKS OF 8 SINGLE START SPIRALS
MAGNETIC SEPERATOR
STRAKE
SHAKING TABLE HOLDING TANK
TO GRINDING
TO HOSE STATIONS
TO CARBON CIRCUIT
TO TRASH & SAFETY SCREENS
CARBON
SAFETY SCREEN
RECLAIM WATER TANK
6 - CIP TANKS
LIME
CYANIDE
TRASH SCREEN
4 - LEACH TANKS
FROM CARBON FILTER
WELL WATER
LIME
FLOCCULANT
FLOCCULANT
PRE-LEACH THICKENER 100' DIA.
CARBON COLUMN FEED TANK
MILL TANK
TAILINGS WASH THICKENER 100' DIA.
TO HEAP LEACH CARBON COLUMN TAILS
TAILINGS PUMPBOX
CYANIDE TAILINGS DETOXIFICATION
TAILINGS POND
DECANT COLLECTION SUMP
DECANT COLLECTION POND
TO PUMP SEALS
GLAND SEAL PUMPBOX
HEAP LEACH PAD
BARREN SOLUTION POND
WELL CAN
PREGNANT SOLUTION POND
WELL CAN
DISTRIBUTOR
CARBON
STATIC SCREEN
MILL CARBON COLUMNS 1 BANK 5 COLUMNS
TO MILL TANK
CARBON
STATIC SCREEN
HEAP LEACH CARBON COLUMNS 2 BANKS 5 COLUMNS
COLLECTION BOX
LOADED CARBON SCREEN
LOADED CARBON STORAGE TANK
WATER
WATER TREATMENT
STRIP SOLUTION HEATING SYSTEM
2 - STRIP VESSELS
HEAT EXCHANGERS
WATER
PREGNANT STRIP SOLUTION TANK
CYANIDE
CAUSTIC
BARREN STRIP SOLUTION TANK
ZINC FEEDER
ZINC FEEDER PUMP
FUNDA FILTER
SHAKING TABLE
TO FURNACE
TO TAILS
ACID WASH TANK
pH PROBE
CAUSTIC
ACID
RE-CIRCULATION TANK
MILL CARBON COLUMNS
CIP TANKS
HEAP LEACH CARBON COLUMNS
DEWATERING SCREEN
STRIPPED CARBON SCREEN
STRIPPED CARBON HOLDING TANK
REACTIVATION KILN
QUENCH TANK
NEW CARBON TANK
FINE CARBON FILTER
TO TAILS WASH THICKENER
FINE CARBON PUMPBOX
BARREL STORAGE
CONDENSER
MERCURY
RETORT
HOOD
PREPERATION TABLE
MELTING FURNACE
CASTING FURNACE
DORE

SOURCE: KILBORN

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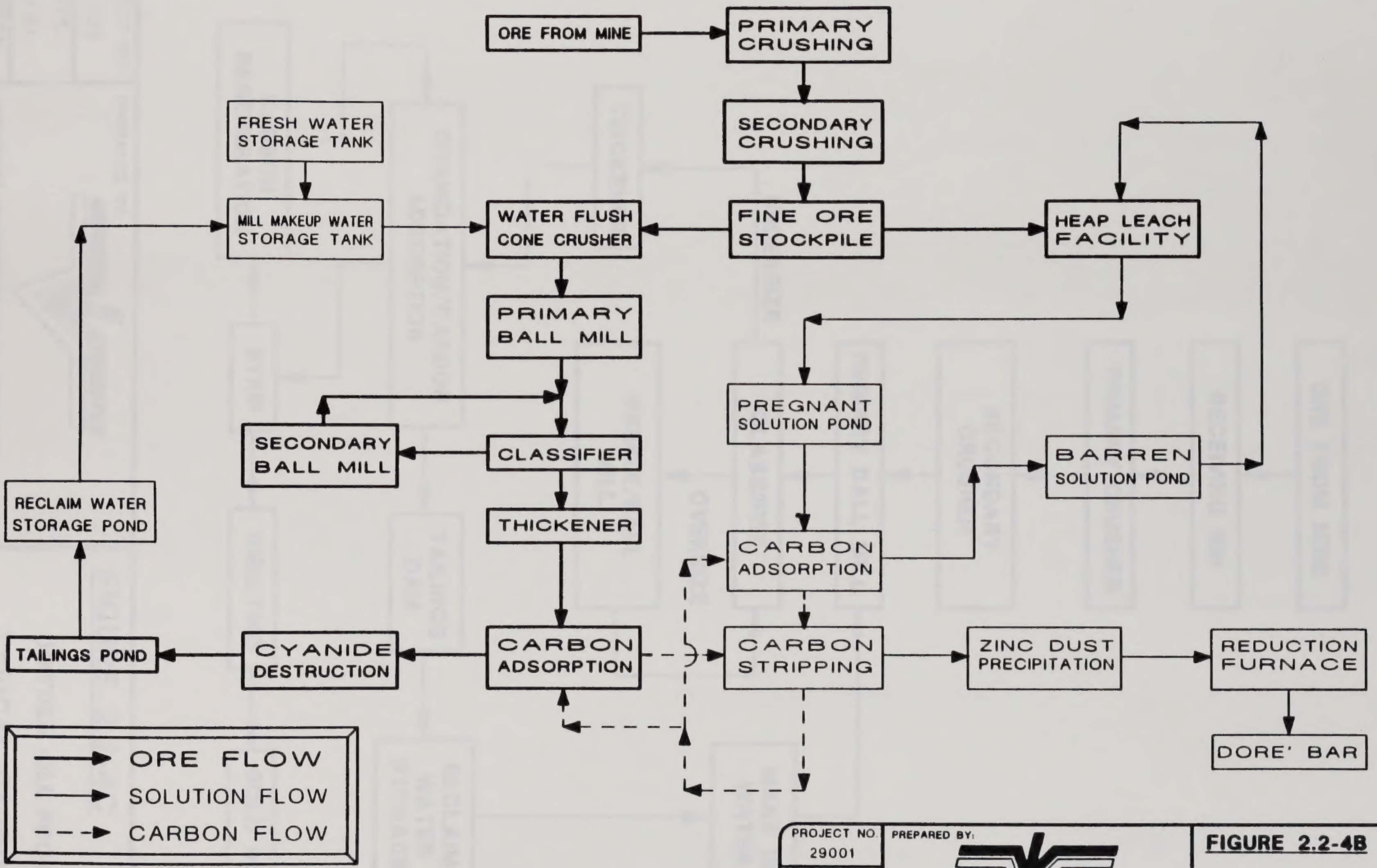
FIGURE 2.2-4A

HAYDEN HILL PROJECT

DETAILED PROCESS DIAGRAM


ORE FROM MINE
PRIMARY CRUSHING
SECONDARY CRUSHING
FRESH WATER STORAGE TANK
MILL MAKEUP WATER STORAGE TANK
WATER FLUSH CONE CRUSHER
FINE ORE STOCKPILE
HEAP LEACH FACILITY
PRIMARY BALL MILL
SECONDARY BALL MILL
CLASSIFIER
THICKENER
PREGNANT SOLUTION POND
BARREN SOLUTION POND
CARBON ADSORPTION
RECLAIM WATER STORAGE POND
TAILINGS POND
CYANIDE DESTRUCTION
CARBON ADSORPTION
CARBON STRIPPING
ZINC DUST PRECIPITATION
REDUCTION FURNACE
DORE' BAR
ORE FLOW
SOLUTION FLOW
CARBON FLOW

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29001	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	**FIGURE 2.2-4B**
DATE 02/91		**HAYDEN HILL PROJECT**
REVISION 0		**SIMPLIFIED FLOW DIAGRAM**

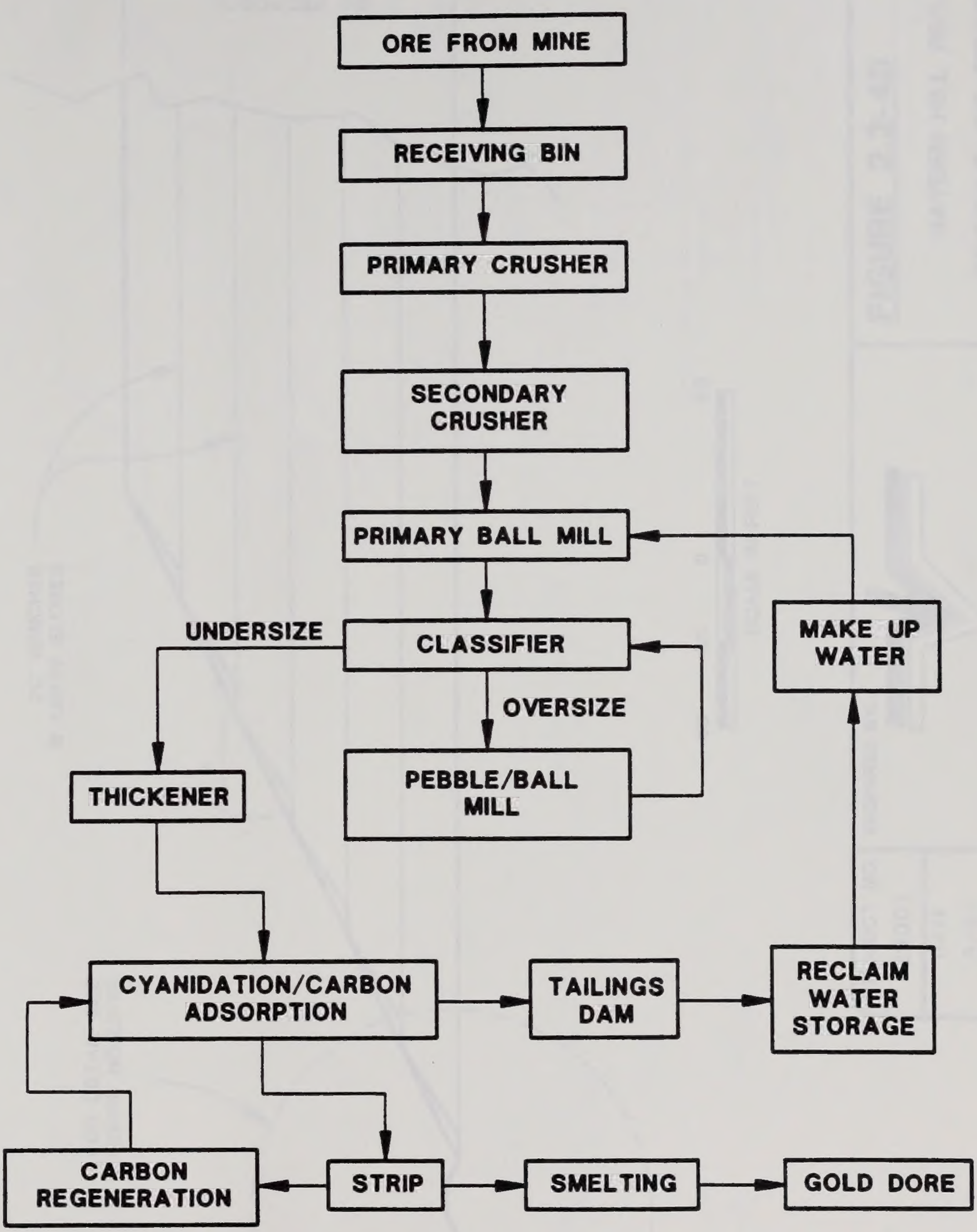
ORE FROM MINE
RECEIVING BIN
PRIMARY CRUSHER
SECONDARY CRUSHER
PRIMARY BALL MILL
UNDERSIZE
CLASSIFIER
OVERSIZE
MAKE UP WATER
THICKENER
PEBBLE/BALL MILL
CYANIDATION/CARBON ADSORPTION
TAILINGS DAM
RECLAIM WATER STORAGE
CARBON REGENERATION
STRIP
SMELTING
GOLD DORE

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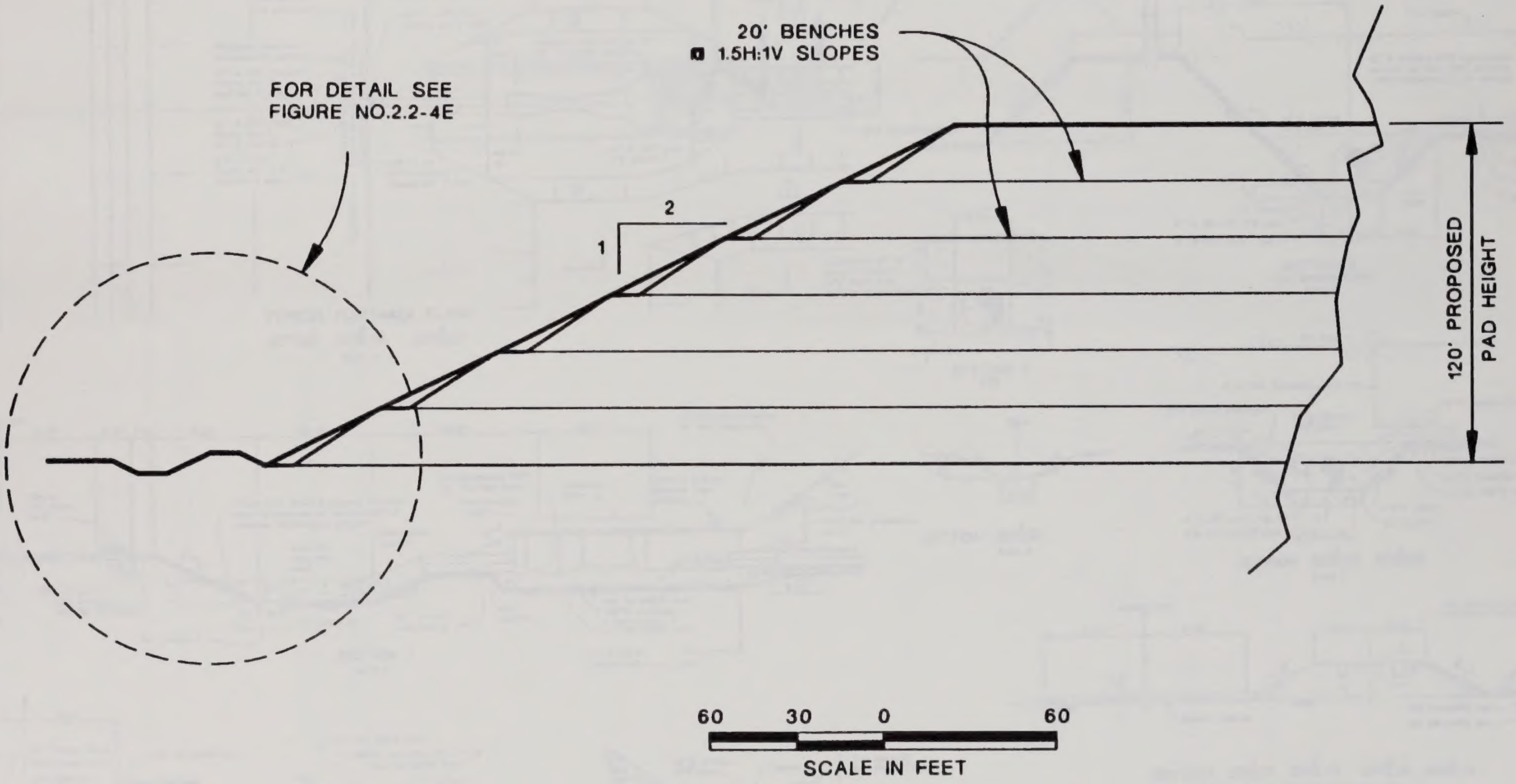
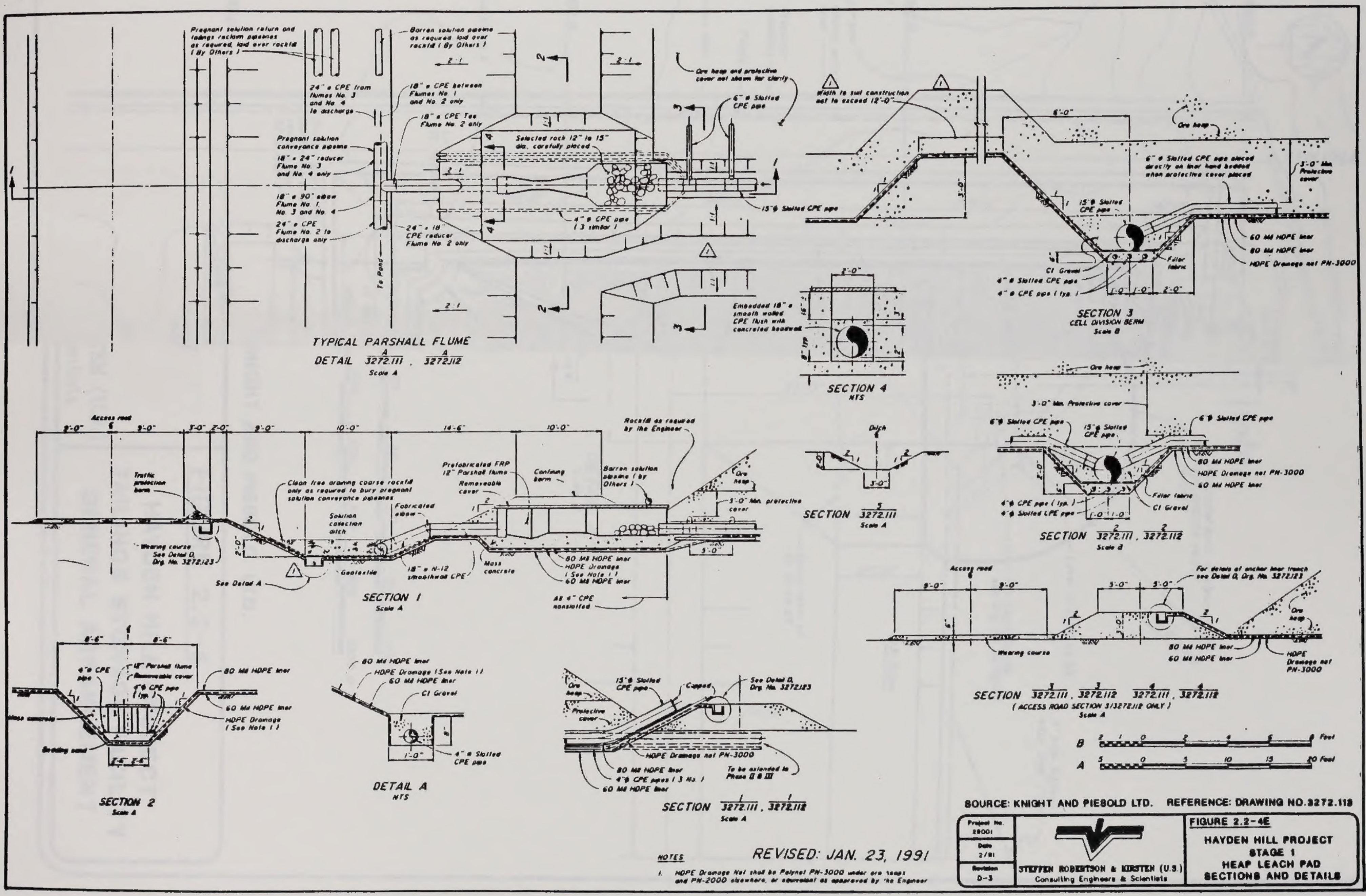
FIGURE 2.2-4C

HAYDEN HILL PROJECT

TYPICAL CARBON IN PULP MILL OPERATION


FOR DETAIL SEE
FIGURE NO.2.2-4E
20' BENCHES
@ 1.5H:1V SLOPES
2
1
120' PROPOSED
PAD HEIGHT
60
30
0
60
SCALE IN FEET

PROJECT NO. 29001	PREPARED BY:	**FIGURE 2.2-4D**
DATE 3/91		HAYDEN HILL PROJECT
REVISION 0	**STEFFEN ROBERTSON & KIRSTEN (U.S.)** Consulting Engineers & Scientists	PROFILE OF PROPOSED HEAP LEACH PAD


Pregnant solution return and tailings reclaim pipelines as required, laid over rockfill (By Others)
Barren solution pipeline as required laid over rockfill (By Others)
24" ø CPE from flumes No. 3 and No. 4 to discharge
18" ø CPE between Flumes No. 1 and No. 2 only
18" ø CPE Tee Flume No. 2 only
Pregnant solution conveyance pipeline
18" × 24" reducer Flume No. 3 and No. 4 only
18" ø 90° elbow Flume No. 1, No. 3 and No. 4
24" ø CPE Flume No. 2 to discharge only
24" × 18" CPE reducer Flume No. 2 only
To Pond
Selected rock 12" to 15" dia., carefully placed
4" ø CPE pipe (3 similar)
Ore heap and protective cover not shown for clarity
6" ø Slotted CPE pipe
15"ø Slotted CPE pipe
2:1
1:1
TYPICAL PARSHALL FLUME
DETAIL A/3272.111 , A/3272.112
Scale A
Width to suit construction not to exceed 12'-0"
6'-0"
3'-0"
Ore heap
6" ø Slotted CPE pipe placed directly on liner hand bedded when protective cover placed
3'-0" Min. Protective cover
15"ø Slotted CPE pipe
60 Mil HDPE liner
80 Mil HDPE liner
HDPE Drainage net PN-3000
Filter fabric
Cl Gravel
4" ø Slotted CPE pipe
4" ø CPE pipe (typ.)
1'-0" 1'-0" 2'-0"
SECTION 3
CELL DIVISION BERM
Scale B
2'-0"
16"
8" typ
Embedded 18" ø smooth walled CPE flush with concreted headwall
SECTION 4
NTS
Ditch
3'-0"
SECTION 5/3272.111
Scale A
Ore heap
3'-0" Min. Protective cover
6"ø Slotted CPE pipe
15"ø Slotted CPE pipe
80 Mil HDPE liner
HDPE Drainage net PN-3000
60 Mil HDPE liner
Filter fabric
Cl Gravel
4"ø CPE pipe (typ.)
4"ø Slotted CPE pipe
2'-0"
1'-0" 1'-0"
SECTION 2/3272.111 , 2/3272.112
Scale B
Access road
9'-0" 9'-0" 3'-0" 2'-0" 9'-0" 10'-0" 14'-6" 10'-0"
Traffic protection berm
Wearing course See Detail D, Drg. No. 3272.123
Clean free draining coarse rockfill only as required to bury pregnant solution conveyance pipelines
Solution collection ditch
Fabricated elbow
Prefabricated FRP 12" Parshall flume
Removeable cover
Containing berm
Barren solution pipeline (by Others)
Rockfill as required by the Engineer
Ore heap
3'-0" Min. protective cover
2'-0"
5'-0"
See Detail A
Geotextile
18" ø N-12 smoothwall CPE
Mass concrete
80 Mil HDPE liner
HDPE Drainage (See Note 1)
60 Mil HDPE liner
All 4" CPE nonslotted
SECTION 1
Scale A
8'-6" 8'-6"
4"ø CPE pipe
12" Parshall flume
Removeable cover
4"ø CPE pipe (typ.)
80 Mil HDPE liner
60 Mil HDPE liner
HDPE Drainage (See Note 1)
Mass concrete
Bedding sand
2'-6" 2'-6"
SECTION 2
Scale A
80 Mil HDPE liner
HDPE Drainage (See Note 1)
60 Mil HDPE liner
Cl Gravel
1'-0"
4" ø Slotted CPE pipe
DETAIL A
NTS
Ore heap
Protective cover
15"ø Slotted CPE pipe
Capped
See Detail D, Drg. No. 3272.123
HDPE Drainage net PN-3000
80 Mil HDPE liner
4"ø CPE pipes (3 No.)
60 Mil HDPE liner
To be extended to Phase II & III
SECTION 1/3272.111 , 1/3272.112
Scale A
Access road
9'-0" 9'-0"
6"
5'-0" 5'-0"
3'-0"
For details of anchor liner trench see Detail D, Drg. No. 3272.123
Ore heap
Wearing course
80 Mil HDPE liner
60 Mil HDPE liner
HDPE Drainage net PN-3000
SECTION 3/3272.111 , 3/3272.112 4/3272.111 , 4/3272.112
(ACCESS ROAD SECTION 3/3272.112 ONLY)
Scale A
B 2 1 0 2 4 6 8 Feet
A 5 0 5 10 15 20 Feet

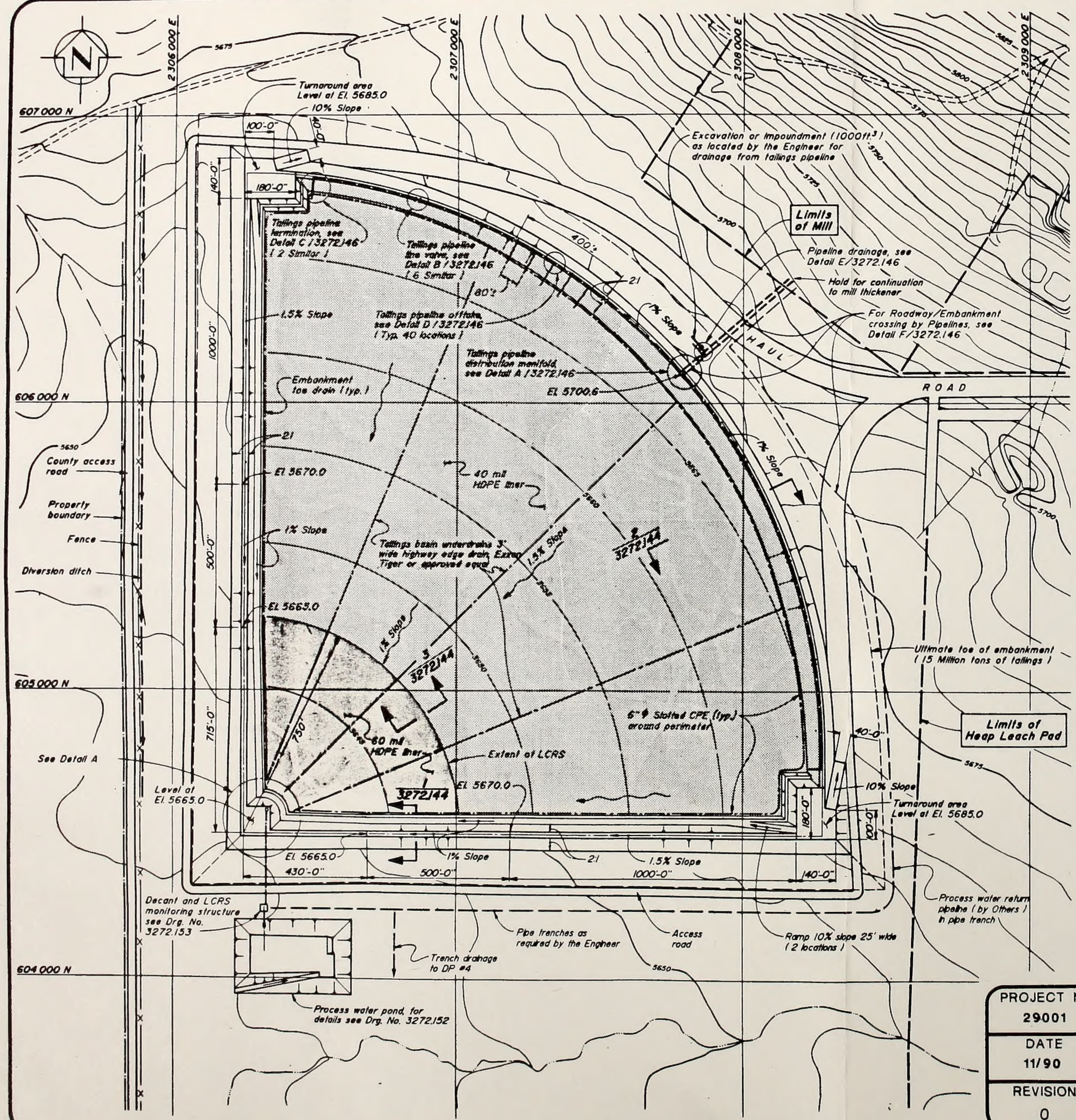
REVISED: JAN. 23, 1991

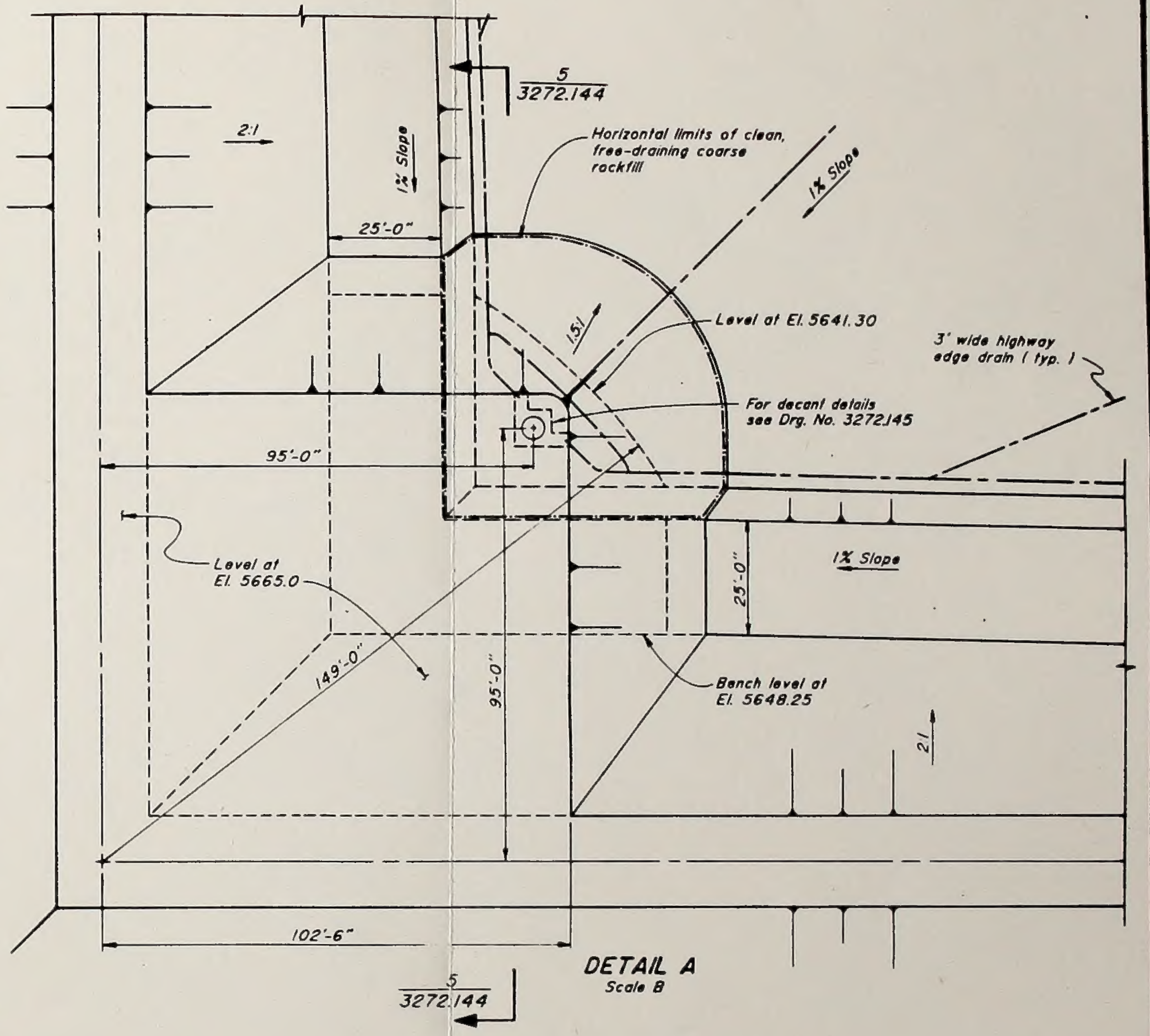
NOTES

1. HDPE Drainage Net shall be Polynet PN-3000 under ore heaps and PN-2000 elsewhere, or equivalent as approved by the Engineer

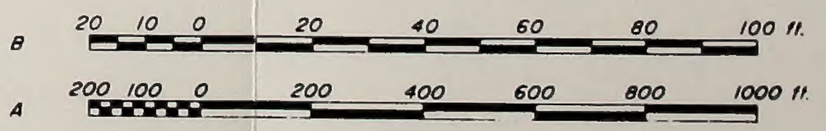
SOURCE: KNIGHT AND PIESOLD LTD. REFERENCE: DRAWING NO.3272.113

Project No. 29001	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	FIGURE 2.2-4E HAYDEN HILL PROJECT STAGE 1 HEAP LEACH PAD SECTIONS AND DETAILS
Date 2/91		
Revision D-3		


N
2306 000 E
2307 000 E
2308 000 E
2309 000 E
607 000 N
606 000 N
605 000 N
604 000 N
Turnaround area Level at El. 5685.0
10% Slope
100'-0"
140'-0"
180'-0"
Tailings pipeline termination, see Detail C / 3272.146 (2 Similar)
Tailings pipeline line valve, see Detail B / 3272.146 (6 Similar)
Tailings pipeline offtake, see Detail D / 3272.146 (Typ. 40 locations)
Tailings pipeline distribution manifold, see Detail A / 3272.146
El. 5700.6
1.5% Slope
1000'-0"
Embankment toe drain (typ.)
2:1
El. 5670.0
40 mil HDPE liner
1% Slope
Tailings basin underdrains 3" wide highway edge drain, Exxon Tiger or approved equal
1.5% Slope
2 / 3272.144
500'-0"
El. 5663.0
1% Slope
3 / 3272.144
715'-0"
750'
60 mil HDPE liner
Extent of LCRS
3272.144
El. 5670.0
6" ϕ Slotted CPE (typ.) around perimeter
Excavation or impoundment (1000ft³) as located by the Engineer for drainage from tailings pipeline
Limits of Mill
Pipeline drainage, see Detail E/3272.146
Hold for continuation to mill thickener
For Roadway/Embankment crossing by Pipelines, see Detail F/3272.146
400'±
80'±
1% Slope
HAUL ROAD
1% Slope
Ultimate toe of embankment (15 Million tons of tailings)
Limits of Heap Leach Pad
40'-0"
10% Slope
Turnaround area Level at El. 5685.0
180'-0"
100'-0"
County access road
Property boundary
Fence
Diversion ditch
See Detail A
Level at El. 5665.0
El. 5665.0
1% Slope
2:1
1.5% Slope
430'-0"
500'-0"
1000'-0"
140'-0"
Decant and LCRS monitoring structure see Drg. No. 3272.153
Pipe trenches as required by the Engineer
Access road
Ramp 10% slope 25' wide (2 locations)
Process water return pipeline (by Others) in pipe trench
Trench drainage to DP #4
Process water pond, for details see Drg. No. 3272.152
5675
5650
5700
5725
5750
5775
5800
5825
5680
5660
5640
5620


5 / 3272.144
2:1
1% Slope
25'-0"
Horizontal limits of clean, free-draining coarse rockfill
1% Slope
1.5:1
Level at El. 5641.30
3' wide highway edge drain (typ.)
For decant details see Drg. No. 3272.145
95'-0"
Level at El. 5665.0
25'-0"
1% Slope
149'-0"
95'-0"
Bench level at El. 5648.25
2:1
102'-6"
5 / 3272.144

DETAIL A
Scale B


B
20 10 0 20 40 60 80 100 ft.
A
200 100 0 200 400 600 800 1000 ft.

SOURCE: KNIGHT AND PIESOLD LTD.

PROJECT NO.	PREPARED BY:	FIGURE 2.2-5
29001	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	HAYDEN HILL PROJECT TAILINGS STORAGE FACILITY GENERAL ARRANGEMENT
DATE 11/90		
REVISION 0		

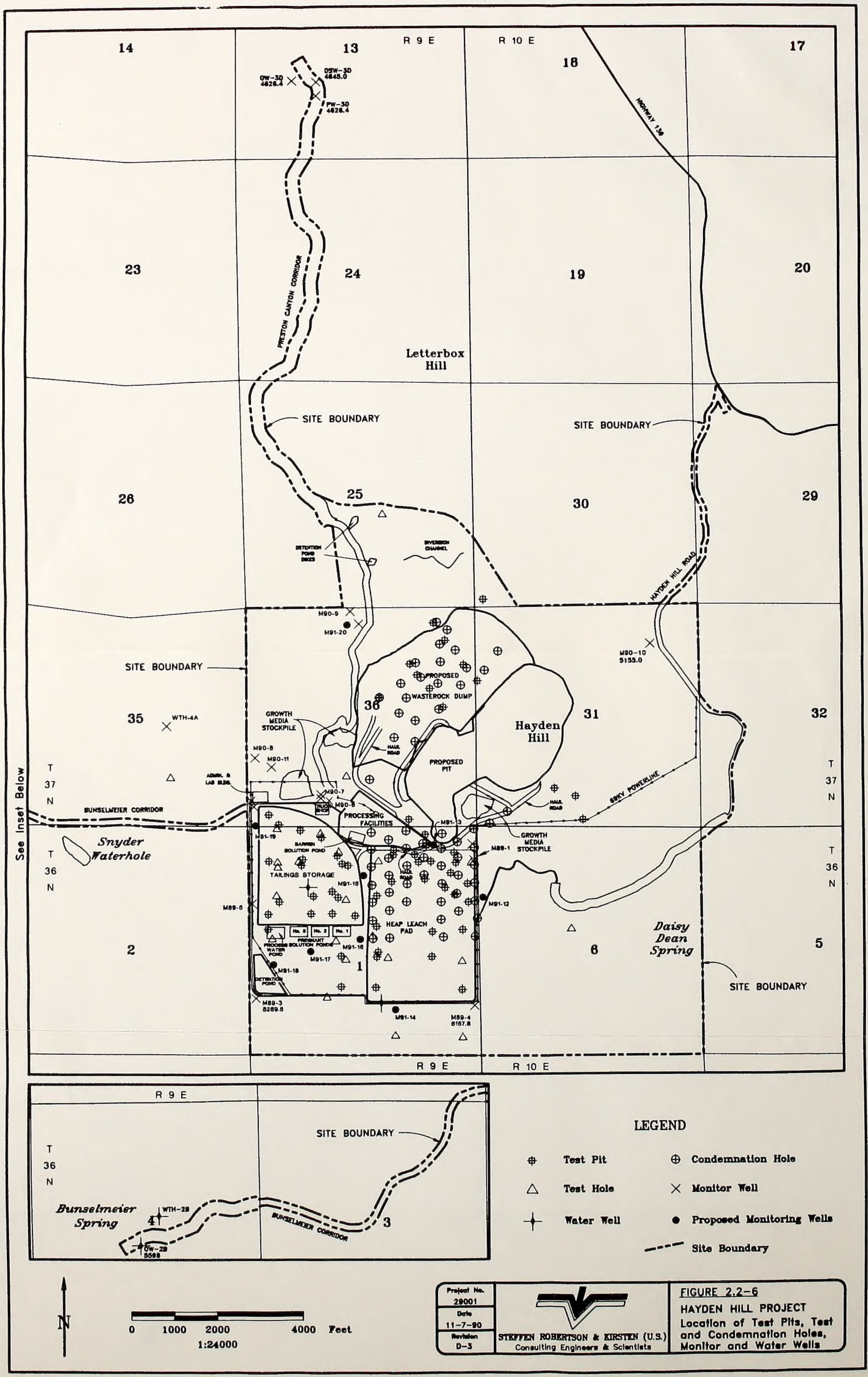
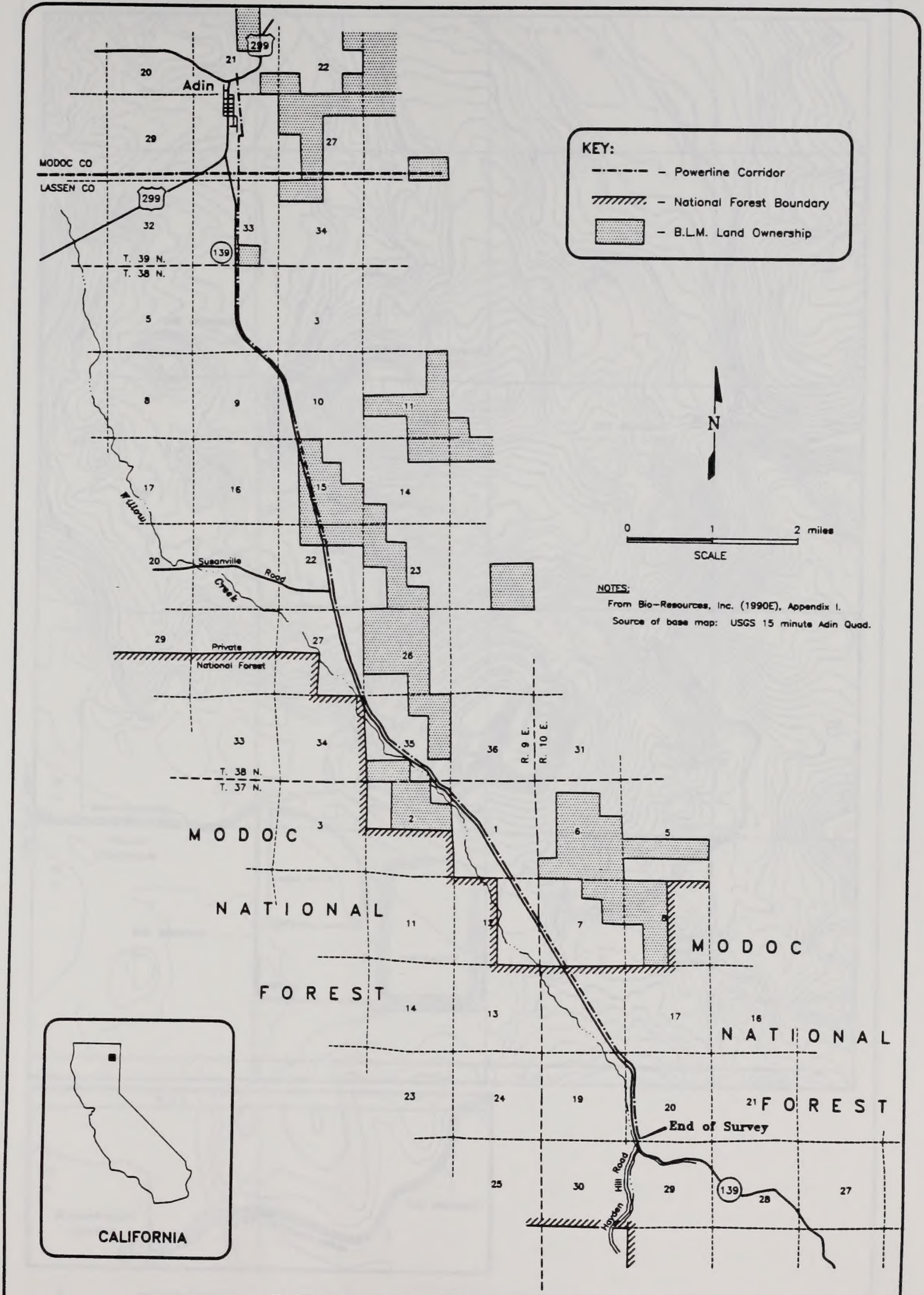
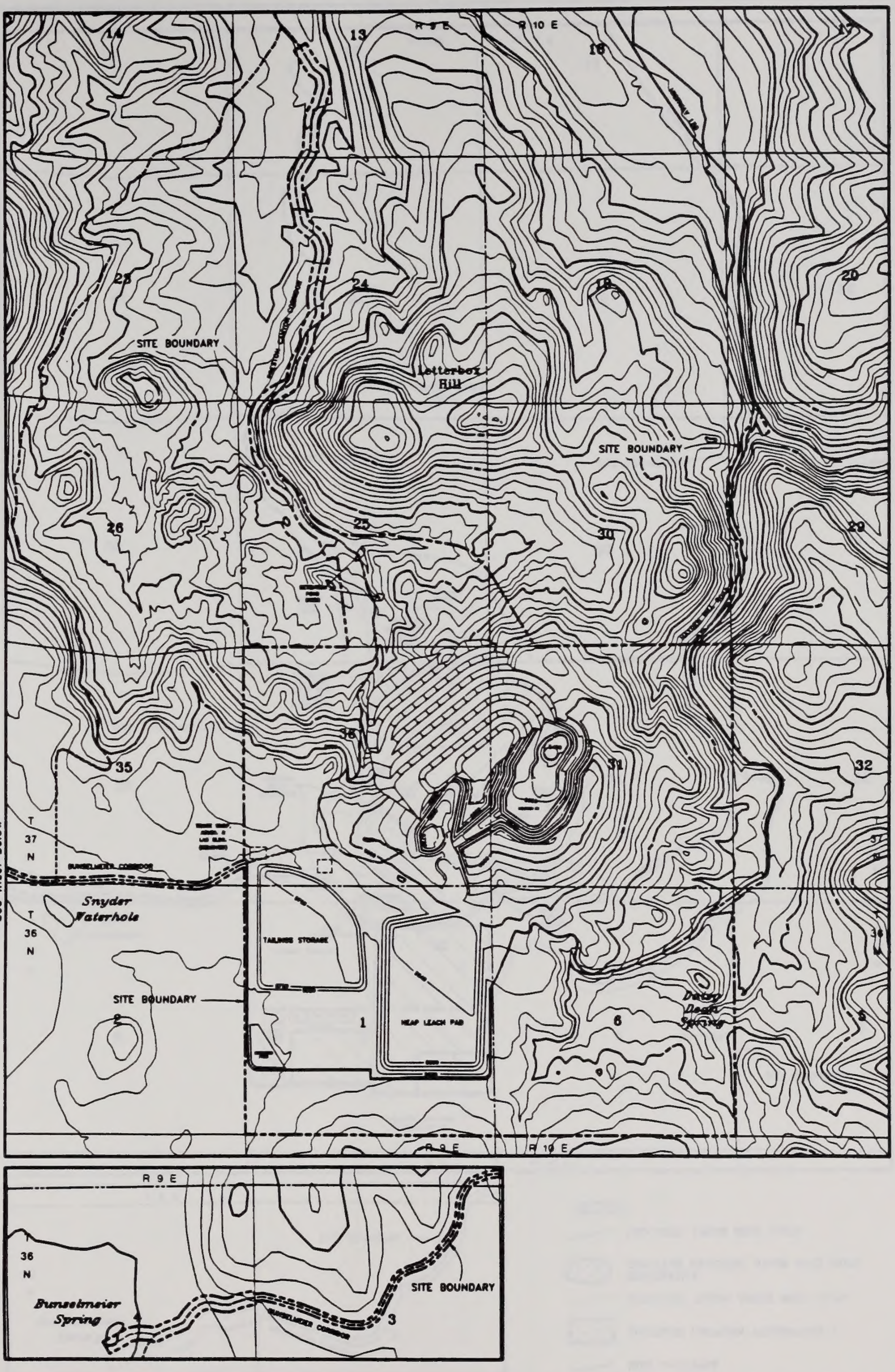

R 9 E
R 10 E
14
13
18
17
23
24
19
20
26
25
30
29
35
36
31
32
2
1
6
5
3
4
T 37 N
T 36 N
OW-3D 4826.4
DSW-3D 4845.0
PW-3D 4826.4
HIGHWAY 139
PRESTON CANYON CORRIDOR
Letterbox Hill
SITE BOUNDARY
DETENTION POND DIKES
DIVERSION CHANNEL
HAYDEN HILL ROAD
M90-9
M91-20
M90-10 5155.0
PROPOSED WASTEROCK DUMP
Hayden Hill
GROWTH MEDIA STOCKPILE
HAUL ROAD
PROPOSED PIT
WTH-4A
M90-8
M90-11
ADMIN. & LAB BLDG.
M90-7
M90-6
TRUCK SHOP
PROCESSING FACILITIES
M91-13
69KV POWERLINE
BUNSELMEIER CORRIDOR
See Inset Below
Snyder Waterhole
M91-19
BARREN SOLUTION POND
TAILINGS STORAGE
M91-15
M89-1
M91-12
M89-5
HEAP LEACH PAD
Daisy Dean Spring
No. 3
No. 2
No. 1
PROCESS WATER POND
PREGNANT SOLUTION PONDS
M91-16
M91-17
M91-18
DETENTION POND
M89-3 5289.5
M91-14
M89-4 5157.8
Bunselmeier Spring
WTH-2B
OW-2B 5598
LEGEND
Test Pit
Condemnation Hole
Test Hole
Monitor Well
Water Well
Proposed Monitoring Wells
Site Boundary
N
0 1000 2000 4000 Feet
1:24000
Project No. 29001
Date 11-7-90
Revision D-3
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

FIGURE 2.2-6
HAYDEN HILL PROJECT
Location of Test Pits, Test and Condemnation Holes, Monitor and Water Wells


Adin
299
139
MODOC CO
LASSEN CO
T. 39 N.
T. 38 N.
T. 37 N.
R. 9 E.
R. 10 E.
Willow Creek
Susanville Road
Private
National Forest
Hayden Hill Road
End of Survey
MODOC NATIONAL FOREST
MODOC NATIONAL FOREST
N
0 1 2 miles
SCALE
CALIFORNIA
KEY:
– Powerline Corridor
– National Forest Boundary
– B.L.M. Land Ownership

NOTES:
From Bio-Resources, Inc. (1990E), Appendix I.
Source of base map: USGS 15 minute Adin Quad.

PROJECT NO.	PREPARED BY:	FIGURE 2.2-7
29001		HAYDEN HILL PROJECT
DATE		
11/90		POWER SUPPLY CORRIDOR
REVISION	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	
0		


R 9 E
R 10 E
14
13
18
17
23
24
19
20
SITE BOUNDARY
Letterbox Hill
SITE BOUNDARY
26
25
30
29
35
36
31
32
See Inset Below
T 37 N
T 36 N
BUNSELMEIER CORRIDOR
Snyder Waterhole
TAILINGS STORAGE
HEAP LEACH PAD
SITE BOUNDARY
2
1
6
5
Daisy Dean Spring
R 9 E
R 10 E
36 N
Bunselmeier Spring
BUNSELMEIER CORRIDOR
SITE BOUNDARY
3

N

CONTOUR INTERVAL = 40 FT.

0 1000 2000 4000 Feet

1:24000

Project No. 29001 Date 11-14-90 Revision D-5	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	FIGURE 2.2-8 HAYDEN HILL PROJECT APPROXIMATE POST-RECLAMATION CONTOURS

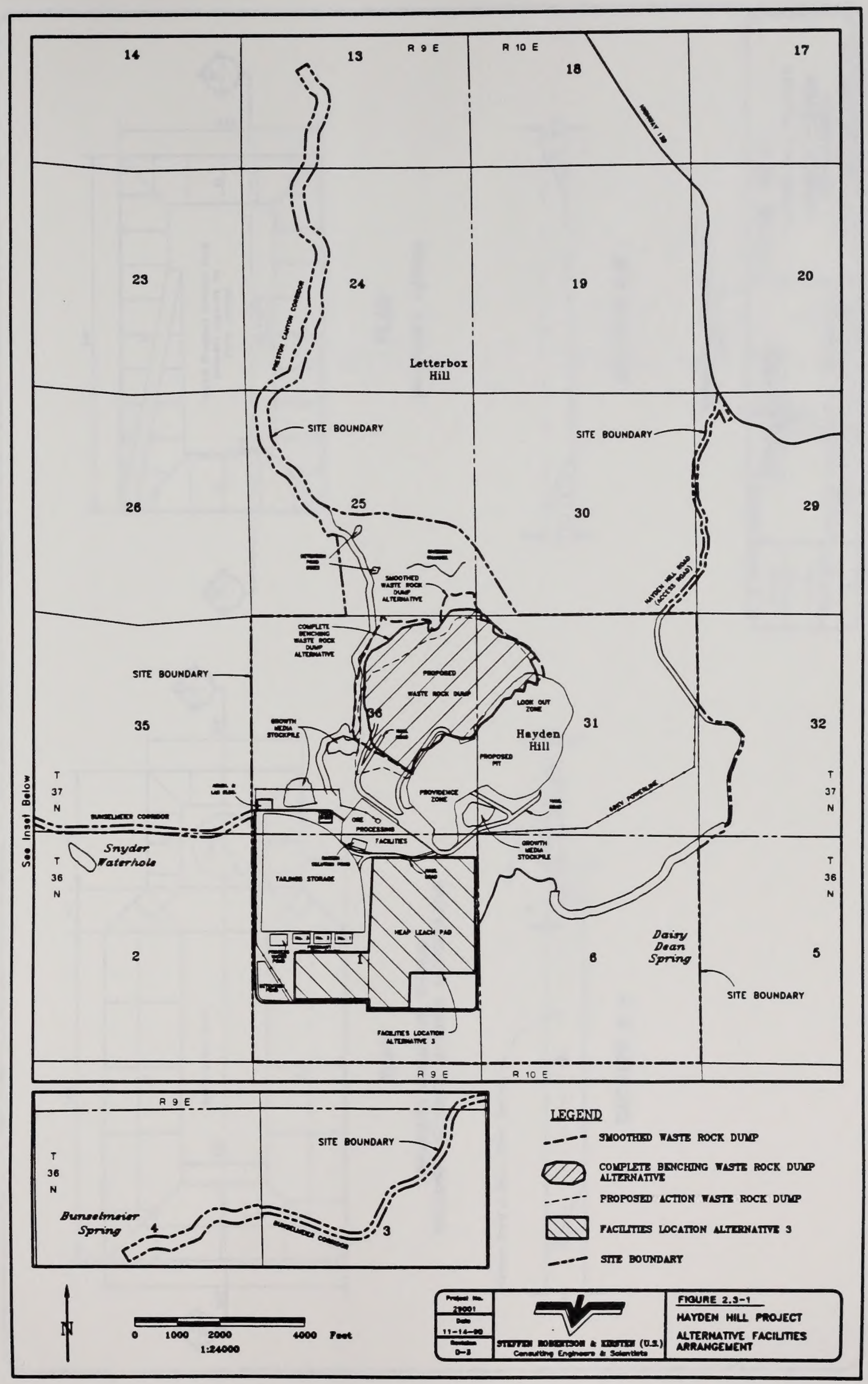
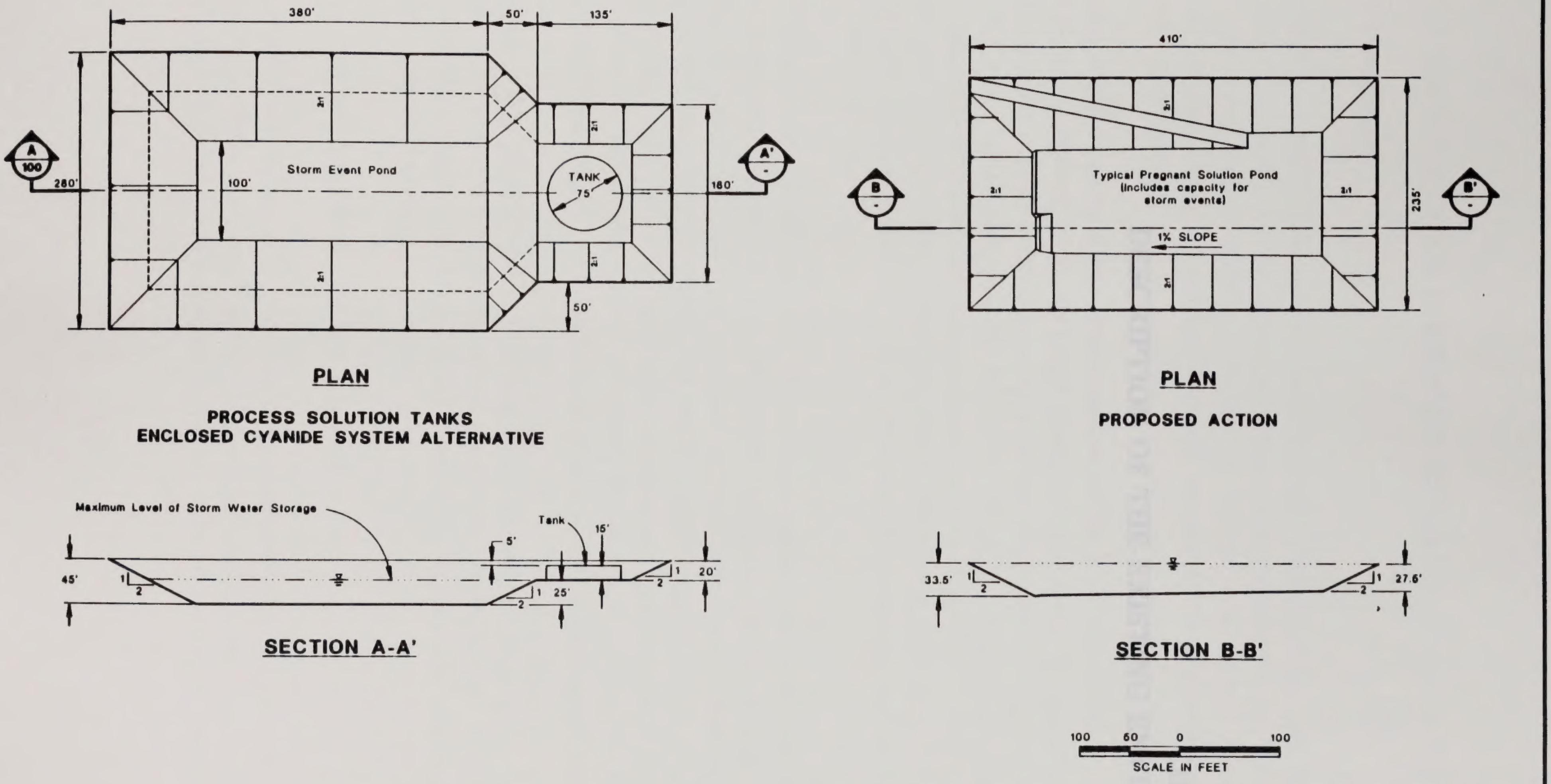

14
13
R 9 E
R 10 E
18
17
HIGHWAY 139
23
24
19
20
PRESTON CANYON CORRIDOR
Letterbox Hill
SITE BOUNDARY
SITE BOUNDARY
26
25
30
29
HAYDEN HILL ROAD (ACCESS ROAD)
SMOOTHED WASTE ROCK DUMP ALTERNATIVE
COMPLETE BENCHING WASTE ROCK DUMP ALTERNATIVE
SITE BOUNDARY
PROPOSED WASTE ROCK DUMP
LOOK OUT ZONE
35
36
31
32
GROWTH MEDIA STOCKPILE
Hayden Hill
PROPOSED PIT
PROVIDENCE ZONE
69KV POWERLINE
T 37 N
T 37 N
BUNSELMEIER CORRIDOR
ORE PROCESSING FACILITIES
GROWTH MEDIA STOCKPILE
See Inset Below
Snyder Waterhole
T 36 N
T 36 N
TAILINGS STORAGE
HEAP LEACH PAD
2
1
6
5
Daisy Dean Spring
SITE BOUNDARY
FACILITIES LOCATION ALTERNATIVE 3
R 9 E
R 10 E
R 9 E
SITE BOUNDARY
T 36 N
Bunselmeier Spring
4
3
BUNSELMEIER CORRIDOR
LEGEND
SMOOTHED WASTE ROCK DUMP
COMPLETE BENCHING WASTE ROCK DUMP ALTERNATIVE
PROPOSED ACTION WASTE ROCK DUMP
FACILITIES LOCATION ALTERNATIVE 3
SITE BOUNDARY
N
0
1000
2000
4000
Feet
1:24000
Project No.
29001
Date
11-14-90
Revision
D-3
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

FIGURE 2.3-1

HAYDEN HILL PROJECT

ALTERNATIVE FACILITIES ARRANGEMENT


380'
50'
135'
280'
100'
Storm Event Pond
2:1
2:1
2:1
2:1
TANK
75'
160'
50'
A
100
A'
-
PLAN
PROCESS SOLUTION TANKS
ENCLOSED CYANIDE SYSTEM ALTERNATIVE
Maximum Level of Storm Water Storage
Tank
15'
5'
45'
1
2
1
25'
2
1
20'
2
SECTION A-A'
410'
235'
B
-
B'
-
Typical Pregnant Solution Pond
(includes capacity for
storm events)
1% SLOPE
2:1
2:1
2:1
2:1
PLAN
PROPOSED ACTION
33.5'
1
2
1
27.6'
2
SECTION B-B'
100
60
0
100
SCALE IN FEET

PROJECT NO. 29001	PREPARED BY:	**FIGURE 2.3-2**
DATE 2/91	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	**HAYDEN HILL PROJECT** **CYANIDE SYSTEM COMPARISON**
REVISION 0		SOURCE: LASSEN GOLD MINING, INC.

CHAPTER 3.0
DESCRIPTION OF THE EXISTING ENVIRONMENT

3.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

3.1 Introduction

In anticipation of the need for an Environmental Impact Report/Environmental Impact Statement (EIR/EIS) at Hayden Hill, baseline studies were initiated by Lassen Gold Mining, Inc. (LGMI) in April 1989. The studies were conducted in a four-section area containing most of the proposed Project activities. Available background information was also reviewed for the surrounding areas of influence for the Proposed Action.

A Scoping Evaluation for the Hayden Hill Project (Project) EIR/EIS (April 27, 1990) was carried out to review the existing baseline studies. As a result of this evaluation, the initial four-section study area was expanded to include locations of an access road, utility corridors, locations of alternatives considered in detail, and areas adjacent to the proposed Project facilities which might be affected by the Proposed Action. The limits of the expanded site boundary are shown on Figure 2.2-1. The site boundary covers approximately 2,822 acres (four sections plus corridors) of which approximately 950 acres would be disturbed by the Proposed Action. The detailed study area for each resource is explained at the beginning of that resource section.

Site specific environmental baseline studies on the expanded detailed study area (herein referred to as the Project Area) were conducted by an interdisciplinary team with expertise in soils, biology, water resources, air quality, socioeconomics, land use, cultural resources, visual resources, transportation, recreation, and noise. Regional studies were carried out for several issues such as visual resources, socioeconomics, and land use. The baseline investigations have been documented in technical reports which are on file with Lassen County, the Alturas Resource Area office of the Bureau of Land Management (BLM), and the United States Forest Service, Modoc National Forest (USFS).

The results of these environmental baseline studies are summarized in this chapter. The disciplines discussed in this chapter include: geology and topography, soils, vegetation and wetlands, wildlife and aquatic biology, surface and groundwater, air quality, socioeconomics, land use, cultural resources, visual resources, transportation, recreation and noise.

3.1.1 Topography and General Site Characteristics

The Project is located in an area of low volcanic hills along the western margin of the Modoc Plateau physiographic province. This area is bounded by the Cascade Range to the west, the Sierra Nevada to the south, and the Basin and Range region to the east. The Modoc Plateau consists of a series of northwest- to north-trending, block-faulted ranges, with intervening basins filled with Miocene to Recent volcanic rocks.

The Project area lies at an elevation ranging from 4,700 feet in Preston Canyon to 6,300 feet at the summit of Hayden Hill. The volcanic knobs or buttes in this area including Hayden Hill and Letterbox Hill exhibit a general northwestern alignment paralleling regional faults.

Climate in the Hayden Hill area is moderate, with warm summer days and cool nights, and cool winter days with cold nights. The area receives approximately 14 to 16 inches of precipitation on an average annual basis, mostly in the form of snowfall.

The Project area contains two sub-basins of the Willow Creek watershed (Figure 3.1-1). The Indian Spring drainage, fed by perennial springs, parallels Hayden Hill Road east of the study area, and flows northward into Willow Creek. The Preston Canyon drainage, located west and north of Hayden Hill, flows northward into Willow Creek. Southwest of the mine site is the Silva Flat sub-basin, a broad, relatively flat, area containing several small bodies of water including Silva Flat Reservoir, Snyder Waterhole, Juniper Lake and Dillon Lake.

The Project area falls generally into the Upper Montane - lower Northern Coniferous Forest ecological zone. Vegetation communities include Low Sagebrush, Upland Shrub, and Jeffrey Pine/Mountain Shrub. Jeffrey Pine/Mountain Shrub occurs on the top and northern slopes of Hayden Hill, while Upland Shrub occurs on the southern slopes. Low Sagebrush, Meadow vegetation, including Pasture, and Riparian vegetation occur on the flats below Hayden Hill. The rocky soils of the area are suitable for wildlife habitat, livestock and timber production, and are generally poorly suited for use as growth media.

The topographic and vegetative structural diversity of the area, combined with the open water and rock outcrops, supports a variety of wildlife species typical to the region. Various resident and migratory birds, reptiles, and mammals including mule deer, pronghorn antelope, skunks, coyote and numerous rodents, are found within the Project boundary. The Modoc sucker, a Federally listed endangered species, may be present in Willow Creek.

There is a considerable amount of existing surface disturbance in the proposed Project area due to past grazing, logging, and mining related activities. Current land use in the Hayden Hill area consists of grazing, watershed, timber production, wildlife habitat, recreation, and minerals exploration. Two Federal grazing allotments lie within the Project site boundary. Commercial timber lands occur along the proposed access and utility corridors. A California State Game Refuge southwest of the mine site includes the southwestern corner of the Project site boundary. Recreational users of the area typically include hunters requiring access to regions west of the Project and a few tourists. Historic mining and recent precious metals exploration have occurred within the study area.

3.1.2 Exploration History

Gold was first discovered at Hayden Hill in late 1869. By 1885, the small mining community of Hayden Hill had a population of about 500 people, most of whom worked in the eight to ten active mines in the district. Total production credited to the district is estimated to have been about 100,000 ounces of gold and 50,000 ounces of silver. Two mines, the Golden Eagle and the Juniper, were the primary producers between 1880 and 1940.

Early mining exploited numerous quartz veins and breccia zones that crop out on the southwest flank of Hayden Hill in what is now the Providence zone. Attempts at developing narrow veins in the Lookout zone were largely unsuccessful.

Interest in the Hayden Hill district was renewed in the mid-1970s, when the district became the focus of numerous exploration efforts. In 1980, Fisher-Watt Mining, having recognized the shallow open-pit potential of the Providence Zone, began extensive and systematic investigations at Hayden Hill. The Lookout zone was subsequently identified as an additional bulk tonnage, precious metals occurrence.

During the 1980s, a number of companies tested the two mineralized zones at Hayden Hill and results of drilling, particularly in the Lookout zone, were inconclusive. In late 1987 Silver State Mining (now U.S. Gold Corporation) entered into an acquisition agreement with Pecos Resources. After drilling about 60 reverse-circulation holes, mainly in the Providence zone, U.S. Gold formed a joint venture with Amax Gold Inc. to further explore the property. Hayden Hill Operating Company, a subsidiary of Amax Gold Inc., initiated an exploration drilling program on behalf of the Hayden Hill Gold Venture in October 1988. Since that time, over 300 reverse circulation holes have been completed totalling approximately 200,000 feet. In addition, nine diamond drill holes have been completed for metallurgical testing.

3.1.3 Existing Surface Disturbance

As a result of past grazing, logging, and mining related activities, there is a considerable amount of existing surface disturbance in the Project area. Grazing has disturbed approximately 2,000 acres of land within the detailed Project study area. Commercial timber production and harvesting has occurred in the area as well. Within the Project site boundary approximately 200 acres of land have been disturbed due to earlier mining and exploration activities. This disturbance consists of small mine dumps and prospects, drill roads and pads, and a pilot-scale heap leach pad.

3.2 Regional Geology

Hayden Hill is within the Modoc Plateau physiographic province, a volcanic region dominated by middle to late Miocene intermediate to silicic lavas, ash flow tuffs, volcanic breccia, and volcaniclastic sedimentary rocks. Less common mafic flows are locally interbedded with thick sequences of volcaniclastic sedimentary rocks. Pliocene and younger rocks are predominantly mafic flows and lesser pyroclastic debris. Much of the region is disrupted by numerous north- to northwest-trending faults. Several major strike-slip faults transect the region, including the Honey Lake Fault to the southeast and the Likely and Surprise Valley Faults to the northeast. They are thought to be northward extensions of the Walker Lane, "right-lateral" fault system.

3.2.1 Hayden Hill Geology

Hayden Hill is a shallow-level epithermal gold-silver deposit associated with late Miocene subaerial hot spring activity that occurred during faulting and contemporaneous explosive volcanism.

In the area immediately surrounding Hayden Hill, middle Miocene rocks comprise a complex succession of intercalated pyroclastic flows, lavas and epiclastic rocks of mainly intermediate composition. The oldest rocks are Stratton Springs Tuff (Tsst), a widespread, +500-foot thick accumulation of partially welded to densely welded ash-flow tuff of dacitic composition (see Figures 3.2-1, 3.6-2, and 3.6-3).

Overlying the Stratton Springs Tuff is a locally thick sequence of interlayered tuffaceous siltstone, sandstone, thin mudflows, conglomerates and minor pyroclastic rocks (Tep and Tlb). Interlayered with and intruding this largely epiclastic sequence are numerous small plugs, dikes, lavas, and pyroclastic flows of andesitic to dacitic composition (Ta and Tadr).

Volcanism resumed locally about 10.5 million years ago (Ma) with the eruption of widespread pumiceous ash-flow tuffs, domes and lavas of the Dago Springs Dacite (Td and Tda). Intruding and partly overlying the Dago Springs Dacite are thick dikes and a lava dome of biotite-bearing felsite. Potassium-argon dating of the felsite indicates an age of 9.8 Ma. Two plug-like masses of dacite are exposed several miles northwest of Hayden Hill in Preston Canyon. One of these glassy plugs, a coarse grained biotite-hornblende quartz latite, is petrographically similar to the felsite of Spring Hill.

After a period of relatively deep erosion during which a surface of moderate relief was formed, a +500 feet thick accumulation of non-welded pyroclastic flows and thin, densely welded tuff were erupted from a vent in Preston Canyon (Tup and Tp). Emplacement of the tuff was accompanied by intrusion of a nearly black, biotite-pyroxene dacitic dike and plug. This dacitic plug is thought to mark the site of the eruptive vent for the Preston Canyon Tuff. Hydrothermally altered remnants of this tuff cap Hayden Hill and are preserved as a number of fault blocks on the north and east flanks of the hill. During a final eruptive event, the area was flooded by basalt flows and related pyroclastic debris of Pliocene or younger age (Tb).

The Hayden Hill district has been dissected by numerous high-angle normal faults. Three prominent fault orientations include north-south, northwest and northeast. Displacement along individual faults typically exceeds 50 feet or more; cumulative displacement along sets of sympathetic faults may exceed 200 feet. This faulting disrupted stratigraphy and provided numerous channel ways along which major veins of the district developed. Movement along some north- and northwest-trending faults postdates mineralization as suggested by the apparent "stepping down" of mineralized blocks to the northeast and the truncation of mineralization along the east edge of the Lookout Zone. Displacement along these younger faults exceeds 100 feet.

3.2.2 Alteration

Hydrothermal alteration at Hayden Hill is widespread and strongly developed in all stratigraphic units. Four alteration zones have been recognized: silicic (quartz materials), sericitic (white mica materials), argillic (clay materials), and propylitic (andesite materials).

At least three stages of silicification can be identified at Hayden Hill. The earliest stage, which is barren of ore-grade gold, forms a broadly flat-lying stratiform zone, or silica cap. This stage consists of dense fine-grained anhedral quartz, minor adularia and traces of disseminated fine-grained sulfides. During this stage, zones of strong to intense silicification were developed mainly in fine-grained rocks and coarse lithic breccias. During later stages of silicification vertical quartz veins and associated stockworks filled fractures in the flat-lying silicified rocks forming steeply dipping ore zones.

North of the summit of Hayden Hill, silicified rocks take on a distinct funnel shape that seems to have been superimposed on the earlier stratiform zones. This funnel-shaped area may represent the major feeder for the hydrothermal system. Generally higher grade gold and silver are encountered in this zone.

Minor sericite together with very minor illitic clay are superimposed on earlier silicic alteration forming indistinct and poorly developed zones. Sericite occurs mainly as a replacement of secondary potassium feldspar.

Two distinct assemblages of argillic alteration form pervasive zones that are peripheral to and underlie silicic alteration. In the shallow portions of the hydrothermal system an alteration assemblage of kaolinite, minor quartz, adularia, and sulfide grades abruptly from silicic alteration. Downward and outward, the kaolinite assemblage is replaced by an assemblage of montmorillonite, adularia, quartz, sulfide, and very minor plagioclase. At deeper levels in the hydrothermal system, argillic alteration is typically intermixed with silicic.

Propylitic alteration occurs along the south and east flanks of Hayden Hill where chlorite, calcite, minor montmorillonite and traces of sulfide are strongly developed in andesite flows. At deeper levels in the Lookout zone, chlorite forms narrow salvages along pyrite-filled fractures that crosscut silicified rocks. Several occurrences of celadonite and calcite were found in Preston Canyon.

3.2.3 Mineralization

Economic mineralization occurs in two zones at Hayden Hill. These are known as the Lookout zone, which contains most of the reserves, and the Providence zone (Figure 3.2-1).

The Lookout zone is a grossly tabular ore zone approximately 1,800 feet long, 800 feet wide, and 600 feet thick that trends north-south across the summit of Hayden Hill. Within the ore zone are a series of irregular and anastomosing zones of quartz veins, stockworks and hydrothermal breccias. Superimposed on this large, low-grade ore zone is a series of northwest- to northeast-striking, steeply dipping, banded quartz-adularia veins. These form discrete zones up to 100 feet thick of higher grade gold.

The Providence zone lies approximately 1,000 feet west of the Lookout zone (Figure 3.2-1). Mineralization in this ore body consists of several narrow, steeply dipping, structurally controlled ore zones that lie within and adjacent to prominent northeast- and northwest-trending quartz veins, breccia zones and stockworks. Gold and silver occur in sets of veins forming zones up to 12 feet thick in lithic breccia, and in irregular zones of stockwork veining up to 50 feet thick in sedimentary rocks.

Gold and silver are hosted by at least two, and possibly more, vein stages. The earliest stages of veining and infilling of hydrothermal breccia are characterized by dense "flinty" sulfidic quartz and minor adularia. "Flinty" veins typically assay 0.015 to 0.05 ounces per ton (opt) gold.

The early veins are crosscut by a somewhat later stage of banded quartz-adularia veining. These veins, up to six inches thick, are typically white, delicately banded and bilaterally symmetric fracture fillings that commonly display coarse lamellar quartz along their centers. The texture of quartz in these veins varies from nearly chalcedonic to coarsely crystalline. Banded quartz-adularia veins commonly contain greater than 0.1 opt gold.

Late stage barren veins composed of dense, very-fine-grained quartz crosscut both sulfidic and banded quartz-adularia veins. The barren veins exhibit sharp irregular walls and contain a dense network of criss-crossing fractures filled with quartz.

Gold occurs as discrete grains ranging from 8 microns (μ) to 1 millimeter (mm) in size (averages 40 μ). The gold fills small vugs and fractures in late-stage quartz veins and veinlets. In oxidized ore, gold occurs mainly as electrum and less commonly as native gold associated with quartz, goethite, and psilomelane. Gold in sulfide ore is observed as encapsulated grains in pyrite, and as native gold and acanthite bounding pyrite. Silver occurs alloyed with gold in electrum as well as in acanthite, tetrahedrite-tennantite and polybastite-pearceite. Base metal sulfides observed microscopically include chalcopyrite, sphalerite, galena, and pyrrhotite. The most abundant sulfides are pyrite and marcasite, accompanied by minor arsenopyrite, pyrrhotite, and rare cinnabar.

Approximately two-thirds of the Lookout zone and nearly all of the Providence zone have undergone deep surficial oxidation. Oxidation is enhanced along fractures and down open quartz veins, but some areas of unoxidized or only partially oxidized ore remain in the upper reaches of the oxidized zone. Total sulfide content of unoxidized ore is generally less than five percent (HHOC 1989b).

3.2.4 Seismicity

The region of Hayden Hill contains few major faults. Significant faults in the vicinity of the Project are the Honey Lake Fault to the southeast, and the Likely and Surprise Valley Faults to the northeast. Other minor faults exist predominantly to the west and northwest of Hayden Hill.

The Project area is within Seismic Zone 3 according to the Uniform Building Code (1985) which corresponds to the probability of major damage during an earthquake event. This zone has potential for an earthquake of modified Mercalli scale of VIII or higher, or an equivalent Richter magnitude of 5.5 or greater (Slemmons et al 1965).

The Project lies near the northwest boundary of the Basin and Range Province. Within a 75 mile radius of the site, 10 earthquakes of Richter magnitude five to six have occurred between 1803 and 1977 (Algermission et al 1983) with the closest occurring about 25 miles southeast of the site. The Basin and Range Province has been divided into areas of similar ages of surface faulting (Thenhaus and Wentworth 1982). Surface faulting documented in the area around the Project site (Zone 14) has occurred during Holocene time (10 to 15 thousand years ago to present). The Project thereby complies with the requirements of the California Administrative Code, Title 23, Article 7, Section 2572.

A record of historical earthquake events in the Project vicinity was obtained from the National Earthquake Information Center in Golden, Colorado by Knight and Piésold, Ltd. (KP 1990a). According to their study, the most significant earthquakes within the region have occurred southeast of the site and have been associated with the Honey Lake Fault. The closest earthquake event of significance was an estimated Magnitude 6.0 event which occurred in 1875 just south of Susanville and at a distance of 50 miles from the site. A similar Magnitude 6.0 event occurred in September 1966 along the same fault system at a distance of 106 miles from the site.

Probabilistic estimates of maximum acceleration and velocity in rock for the Project area were determined from a study by Algermissen et al (1983) by Welsh Engineering, Inc. (1989a) during the initial design of the heap leach pad. The study by Algermissen used historic and geologic data (i.e. characteristics of Holocene and Quaternary faulting) to produce maps of acceleration and velocity for various time exposures at the 90-percent probability level of nonexceedence. Based upon results for the study area, Welsh Engineering concluded there is a 90 percent probability that an acceleration of 0.04 gravity (g) and a velocity of 4 to 6 centimeters per second (cm/s) will not be exceeded in a 10 year period.

A Cornell type seismic risk analysis for the Project site was subsequently carried out by KP (1990b) using data from the historical earthquake records mentioned above. This is also a probabilistic approach, and is considered appropriate for the Hayden Hill site due to the absence of any significant faults close to the site.

Results of this second study are similar to findings of Welsh Engineering, and include data for greater return periods. For a return period of 100 years and an active life of 10 years the corresponding probability of exceedence is 9.5 percent, and is appropriate for low risk geotechnical structures. For structures with a significant hazard rating a return period of 475 years is generally used. The peak ground motions given by the seismic risk analysis are as follows:

Return Period (years)	100	475
Probability of exceedence in 10 years (percent)	9.5	2.1
Peak horizontal acceleration (g)	0.078	0.144
Peak horizontal velocity (cm/s)	8.2	17.8

The above design accelerations are appropriate for "low" and "significant" hazard rating geotechnical structures at the site (KP 1990b). Earthquake design criteria for all structural components of the surface facilities should be in accordance with the Lassen County requirements, and the Uniform Building Code standards which place the site in a Seismic Zone 3.

3.2.5 Geotechnical Investigations

3.2.5.1 General

The objectives of the geotechnical investigations performed at the Project site include:

- Evaluation of subsurface soil conditions and geology;
- Retrieval of representative soil samples and geologic materials for geotechnical laboratory testing;
- Evaluation of groundwater and hydrogeological conditions;
- Assessment of the availability of on-site construction materials; and
- Identification of geotechnical design parameters.

The available geotechnical information is comprised of geotechnical and geological studies conducted by various entities, as listed chronologically below:

- LGMI: Condemnation boreholes (1988/1989).
- Welsh Engineering, Inc.: Geotechnical explorations (1988);
- Hydro-Search, Inc. (HSI): Hydrogeological exploration (1989); and
- Denver Knight Piésold, Inc. (DKP) (1990).

Detailed reports describing the aforementioned geotechnical investigations are available for review at the Lassen County Planning Department and the Alturas Resource Area BLM Office. The locations of test pits and drill holes are shown on Figure 2.2-6.

3.2.5.2 Geotechnical Investigations of the Proposed Heap Leach Site

Geotechnical investigations of the proposed heap leach facility site included test pit excavation and the drilling of exploratory boreholes. The geotechnical field exploration program completed by Welsh Engineering included 15 test pits and five boreholes, of which five test pits and two boreholes were located within the heap leach facility. KP completed an additional 10 test pits in the vicinity of the heap leach pad area. Other geological information was derived from 22 condemnation drill holes, and one water exploration drill hole.

Geotechnical testing completed in conjunction with the borehole exploration program included standard penetration testing (SPT), rock quality designation (RQD), falling head permeability tests, and water quality tests (temperature, electrical conductivity, and pH). Laboratory testing of soils retrieved during field exploration activities included grain size and hydrometer analyses, unit weight and moisture content determination, atterberg limits, soil classification, permeability testing, compaction testing (moisture-density relationship), triaxial shear strength testing, and column attenuation testing.

The results of the field exploration and geotechnical laboratory testing program, in conjunction with published correlative engineering soil properties, were utilized for the geotechnical design of the heap leach facility. This geotechnical information was used to evaluate:

- Major sources of suitable construction materials;
- The suitability of native or imported soils for leach pad liner and bedding materials;
- The stability of the heap leach facility; and
- Compliance with permeability requirements imposed by regulatory agencies.

3.2.5.3 Geotechnical Investigations of the Proposed Tailings Disposal Site

Geotechnical investigations of the proposed tailings disposal facility site included test pit excavation and the drilling of exploratory boreholes. The geotechnical field exploration program completed by KP included 19 test pits and six boreholes located in the vicinity of the tailings disposal facilities. Five boreholes drilled as part of Welsh Engineering tailings impoundment site selection study are located in the vicinity of the tailings disposal facility.

Geotechnical testing completed in conjunction with field exploration activities included SPT, RQD, falling head permeability tests, and test pit percolation tests. Laboratory testing of soils retrieved during field exploration activities included grain size and hydrometer analyses, unit weight and moisture content determination, atterberg limits, soil classification, permeability testing, compaction testing (moisture-density relationship), and triaxial shear strength testing.

The results of the field exploration and geotechnical laboratory testing program, in conjunction with published correlative engineering soil properties, were utilized in the geotechnical design of the tailings disposal facility. The geotechnical information was used to evaluate:

- Major sources of suitable construction materials;
- The suitability of native or imported soils for impoundment liner and embankment materials;
- The stability of the embankment and impoundment area; and
- Compliance with permeability requirements imposed by regulatory agencies.

3.2.5.4 Geotechnical Investigation of the Proposed Waste Rock Disposal Sites

Geotechnical investigations of the proposed waste rock disposal facilities included test pit excavation and the drilling of exploratory drill holes. Ten test pits were excavated by KP. Supplementary to test pit excavation, 20 condemnation drill holes were drilled in the waste rock area.

KP accepts that the strength parameters suggested in the U.S. Forest Service, InterMountain Region, Draft Dump Stability Performance Objectives and Evaluation Standards are reasonable lower bound parameters for the stability analyses of waste dumps in general as long as no adverse ground conditions were identified in the geotechnical investigations. The geotechnical investigations comprised 10 test pits in the waste dump area and generally indicated a shallow to medium depth of sandy gravelly colluvium overlaying Letter Box Canyon siltstone. One test pit identified a clay deposit of very limited extent. The clay was stiff and showed relic structures of lapilli tuff (TP-WD-3). As this clay was an isolated pocket, it was considered that it would have little or no effect on dump stability. Notwithstanding this, an undisturbed sample was taken for triaxial testwork which gave a lower bound undrained cohesive strength of 4900 pounds per square foot (psf). This confirmed the clay to be hard.

On the basis of the visual evaluation of the soils in the test pits and the testwork carried out on the isolated clay pocket, it was concluded that the U.S. Forest Service suggested strength parameters would provide a lower bound for dump stability assessment and that no further geotechnical testwork was warranted.

3.2.5.5 Results of Geotechnical Testing

Based on the results of the geotechnical investigations and consequential laboratory testing program performed for the Project, the reports prepared by Welsh Engineering, Inc. and KP present analyses and conclusions which suggest that the geotechnical design of the heap leach facility, tailings disposal facility, and waste rock disposal facility will satisfy the requirements of regulatory agencies with respect to stability, environmental containment, and overall operational safety. The geotechnical design was based on assumed conditions of operation in conjunction with sound engineering practices.

3.3 Soil Resources

This section provides a brief description of soils within the site boundary. The following references were consulted to prepare this section: Soil Survey of the Hayden Hill Area, (USSCS 1990a); Topsoil, Vegetation, and Wildlife Inventory at Hayden Hill, California (Bio-Resources 1990a), Materials Resource Inventory (Jensen and Dean 1990); Plan of Operations for the Hayden Hill Gold Venture, (HHOC

1989a); Scoping Evaluation for the Hayden Hill Project EIR/EIS (SRK 1990); and the Plant and Animal Survey of the Willow Creek Powerline Corridor, (Bio-Resources 1990d).

The description of soil resources within the site boundary and the Bunselmeier and Preston Canyon well field corridors is based on the Materials Resource Inventory (MRI) prepared by Jensen and Dean under contract to LGMI. In the MRI soil survey information is presented at 1:16,900 scale for lands within the site boundary and for the main access road corridor. Information for the Bunselmeier and Preston Canyon corridors is presented at 1:15,000 scale. Mapping units are consociations of (uncorrelated) soil series and miscellaneous land types. Mapping unit compositions are not given, and inclusions are not described.

The description of soils within the power line corridor is based on Soil Conservation Service (SCS) and Forest Service mapping provided in the Plant and Animal Survey of the Willow Creek Powerline Corridor prepared by Bio-Resources, Inc. under contract to LGMI. Soil survey information is presented at approximately 1:74,00 scale (1 inch = 6,230 feet). Mapping units are complexes and associations of suborders, great groups, subgroups, families, and series.

A soils map and accompanying legend for the mine site, the main access road, and the Bunselmeier Canyon and the Preston Canyon corridors is presented in Figure 3.3-1. A soils map for the power line corridor is presented in Figure 3.3-2. Soil characteristics and the approximate acreages of each soil taxon within the site boundary for the Proposed Action are summarized in Table 3.3-1. Not all of the acreages reported in Table 3.3-1 will be disturbed or excavated by the Proposed Action, so the acreages reported here in some cases are larger than the impact acreages reported in Section 4.2.3.2, Soil Resource Impact Analysis. More detailed descriptions of soil characteristics are given in the previously cited baseline studies, which are on file with the Lassen County Planning Department.

Two soil temperature regimes are represented within the site boundary for the Proposed Action. The warmer mesic regime occurs at lower elevations and on south facing slopes. The cooler frigid regime occurs on northern aspects and at higher elevations. Soil parent material are extrusive igneous rocks, including basalt and tuff, and alluvium from mixed volcanic sources.

Local soils have thick, dark surface horizons caused by the accumulation of organic matter. Measured organic matter concentrations in the surface horizons range from about 1.4 to 3.8 percent of dry weight. Measured subsoil concentrations of organic matter range from about 0.9 to 1.5 percent. Soil depth ranges from a few inches to over 5 feet. Seventy percent of the 3,484-acre area mapped by Jensen and Dean is occupied by soils that are between 20- and 60-inches deep. Moderately deep and deep soils occupy

TABLE 3.3-1

TABLE OF SOIL CHARACTERISTICS

Map Unit Component	Approximate Acreage [1]	Slope (%)	Depth (in)	Texture		Coarse Fragments (% vol)		% Organic Matter		Permeability	Effective Rooting Depth (in)
				0-12 in	> 12 in	0-12 in	> 12 in	0-12 in	> 12 in		
Brisco cobbly loam	448.8	20-50	40-50	cb-l	vcb-l	15-35	20-50	3.1	N/A	Mod	27
Erig very stony loam	183.6	20-40	40-50	vst-sil	vcb-sil	>35	35-80	9.5 anomaly	N/A	Mod to Mod Slow	32
Erig stony loam	95.9	10-20	40-50	st-l	vcb-scl	>35	35-60	N/A	N/A	Mod to Mod Slow	32
Ricketts gravelly loam	549.3	5-40	20-40	gr-l	vgr-l	15-35	35-60	3.1	N/A	Mod to Mod Slow	24
Orhood gravelly loam	134.6	5-40	12-20	gr-l	excb-l	<25	35-60	2.6	N/A	Mod to Mod Slow	10
Unnamed loam	76.2	15-40	40->60	l	gr-l	<35	<35	2.8	1.5	Mod	36
Jellycamp gravelly loam	480.5	2-5	12-20	gr-l	cl	15-35	<15	1.9	N/A	Very Slow	12-20
Vansickle very cobbly loam	78.4	2-8	12-22	vcb-l	vgr-cl	30-80	40-80	1.4	N/A	Slow	12-22
Patburn loam	38.9	2-4	24-36	gr-l	vgr-l	0-35	15-60	2.2	N/A	Slow	20
Patburn loam, eroded	16.1	0-1	24-36	gr-l	vgr-l	0-35	15-35	N/A	N/A	Slow	20
Floodplain silt loam	30.8	2-4	>60	sil	gr-cl	<15	15-35	3.8	0.9	Slow	24
Hydric silt loam	0.4	0-2	>60	sil	gr-cl	<15	20-45	N/A	N/A	Slow	N/A
Fiddler gravelly loam	160.9	10-40	24-30	gr-l	cb-sicl	5-35	5-20	2.2	1.2	Slow	24
Deven variant loam	101	5-30	10-18	l	sil	5-20	20-45	1.4	N/A	Slow	10-18
Searvar cobbly loam	221	5-15	32-36	cb-l	gr-cl	15-25	15-35	1.7	N/A	Slow	20

TABLE 3.3-1

TABLE OF SOIL CHARACTERISTICS
(continued)

Map Unit Component	Approximate Acreage[1]	Slope (%)	Depth (in)	Texture		Coarse Fragments (% vol)		% Organic Matter		Permeability	Effective Rooting Depth (in)
				0-12 in	>12 in	0-12 in	> 12 in	0-12 in	>12 in		
Dotta gravelly loam	67.4	2-5	40-60	gr-l	gr-cl	15-35	<15	2.2	N/A	Mod Slow	30
Adinot very cobbly sandy loam	0.4	15-30	14-20	vcb-sl	cl	35-60	35-60	N/A	N/A	Mod Slow	N/A
Adinot very gravelly sandy loam	2.3	2-15	14-20	vgr-sl	vgr-cl	35-60	<15	N/A	N/A	Mod Slow	N/A
Adinot very gravelly sandy loam, eroded	1.4	2-15	4-10	vgr-sl	l	35-60	<15	N/A	N/A	Mod	N/A
Adinot very stony loam	1.0	2-15	14-20	vst-l	cl	35-60	<15	N/A	N/A	Mod Slow	N/A
Dotta sandy loam	0.6	2-5	>60	sl	scl	<15	<15	N/A	N/A	Mod Slow	N/A
Bieber gravelly sandy loam	2.4	0-5	8-20	gr-sl	cl	15-35	<15	N/A	N/A	Very Slow	N/A
Modoc sandy loam	1.4	0-5	20-40	sl	scl	<15	<15	N/A	N/A	Mod Slow	N/A
Oxendine extremely gravelly sandy loam	1.6	0-5	10-14	vgr-sl	scl	>60	<15	N/A	N/A	Mod Slow	N/A
Sweagert loam	0.9	0-5	20-40	l	cl	45	<15	N/A	N/A	Slow	N/A
Malinda extremely gravelly sandy loam	6.9	15-30	14-20	exgr-sl	grcl	>60	15-35	N/A	N/A	Mod Slow	N/A
Hennill silt loam	1.5	0-2	>60	sil	sil	<15	<15	N/A	N/A	Mos Slow	N/A
Pastolla mucky silt loam	0.1	0-2	>60	sil	sil	<15	<15	N/A	N/A	Very Slow	N/A

TABLE 3.3-1

TABLE OF SOIL CHARACTERISTICS
(continued)

Map Unit Component	Approximate Acreage[1]	Slope (%)	Depth (in)	Texture		Coarse Fragments (% vol)		% Organic Matter		Permeability	Effective Rooting Depth (in)
				0-12 in	> 12 in	0-12 in	> 12 in	0-12 in	> 12 in		
Jellycamp very cobbly loam	0.6	2-15	10-20	vcb-l	c	35-60	<15	N/A	N/A	Very Slow	N/A
Splawn very cobbly loam	0.5	2-15	20-40	vcb-l	exgr-c	35-60	>60	N/A	N/A	Slow	N/A
Ollierivas loam	0.5	2-15	20-40	l	cl	<15	<15	N/A	N/A	Slow	N/A
Packwood family	1.2	1-10	8-15	vst-l	cl	35-60	<15	N/A	N/A	Slow	7-15
Bieber family	1.0	1-10	8-20	vcb-l	c	35-60	<15	N/A	N/A	Very Slow	8-20
Gwin family	1.2	40-70	10-20	vcb-l	excb-cl	35-60	>60	N/A	N/A	Mod Slow	10-20
Pass Canyon family	0.5	40-60	10-20	vcb-l	cl	35-60	<15	N/A	N/A	Mod Slow	10-20
Lithic Xerorthents, mesic	0.5	40-70	4-10	vcb-l	---	35-60	---	N/A	N/A	Mod	4-10
Lithic Xerorthents, mesic	0.1	1-20	4-10	vcb-l	---	35-60	---	N/A	N/A	Mod	4-10
Xerofluvents, mesic	0.1	1-10	>60	l	l	<15	<15	N/A	N/A	Slow	>20
Aquolls	0.1	0-2	>60	sicl	c	<15	<15	N/A	N/A	Variable	>40
Rock outcrop	4.5	N/A		. . . . . Miscellaneous Land Type							
Earth dam	2.8	N/A		. . . . . Miscellaneous Land Type							
Water	3.8	N/A		. . . . . Miscellaneous Land Type							
Deven family	0.2	1-15	10-20	cb-l		<15	<15	N/A	N/A	Slow	10-20
Pass Canyon family	0.1	1-15	8-14	cb-l		<15	<15	N/A	N/A	Mod Slow	8-14
Keating family	0.1	1-15	20-40	cb-cl		15-35	<15	N/A	N/A	Slow	20-40
Total	2,722.1										

Notes: [1]Approximate acreage includes all areas that will be disturbed and areas that will not be disturbed within the mine site boundary, well field corridors, access road corridors, and utility corridor. A 20-foot width is assumed for all corridors. In addition to the 20-foot width, the approximate acreage estimates include three 40-foot by 40-foot drill pads within each of the well field corridors.

mountain sideslopes and narrow, nearly level alluvial terraces. Shallower soils underlain by duripan, (i.e., silica indurated hardpan) are extensive in the northern two thirds of Section 1 on undulating, eroded plateaus and terraces. These soils roughly correlate with the Low Sagebrush vegetation type discussed in Section 3.4.

As shown in Table 3.3-1, most of the local soils contain significant quantities of rock fragments. Eighty-nine percent of the area mapped by Jensen and Dean is occupied by soils that are less than 20 inches deep or that contain more than 35 percent rock fragments (volume basis), in portions of the soil profile. Jensen and Dean observed roots to the base of the B horizon or to at least 20-inches throughout the Project area. Chemical analyses completed by Jensen and Dean suggest that saline or sodic soil conditions do not occur, although inconsistencies in the lab data were noted.

3.4 Vegetation

This section provides a description of the vegetation communities at the Hayden Hill Project within the site boundary. The following paragraphs summarize the work done to define the existing vegetation and describe the existing vegetational conditions at the Hayden Hill site. Within the site boundary, the level of vegetational analysis varies in different areas. Sections 36, R9E, T37N; 1, R9E, T36N; 31, R10E, T37N; 6, R10E, T36N; and the waste rock dump area of Section 25, R9E, T37N were studied quantitatively by the use of plots and transects (Bio-Resources 1990b, c, e). The Preston Canyon, Bunselmeier Spring and access road corridors were visually surveyed for threatened or endangered species and vegetation type (Figure 3.4-1). The work in these areas was done by Bio-Resources, Inc. in June of 1989 and May and July of 1990 (Bio-Resources 1990a, c, e). The power line corridor was visually surveyed for threatened and endangered species and vegetation type by Bio-Resources, Inc. in September of 1990 and May of 1991 (Bio-Resources 1990d, 1991c). The Snag Hill area, the site of the proposed fire tower replacement, was visually surveyed by Bio-Resources in the summer of 1989 (Figure 3.4-2) (USFS 1990b).

A field investigation was conducted by North State Resources in June 1990 to confirm the presence of and to delineate wetland boundaries at a general level of resolution. The field investigation included all areas within the mine site boundary. The power line corridor was excluded from this investigation. The power line corridor was surveyed for wetlands by Bio-Resources in October of 1990 (Bio-Resources 1990d). A further study of wetlands was conducted by Soil Resource Investigations in August 1990. This study was done at a level of resolution consistent with the Federal Manual for Identifying and Delineating Wetlands (USACE 1989). The Soil Resources Investigations delineation was done on an area of approximately 2500 acres which incorporates the majority of Sections 1, 6, 31 and 36 and the access road (Figure 3.4-3). The impact analysis for wetlands will address the North State Resources and Soil Resources Investigations delineations. Figure 3.4-3 is a composite of these two studies showing the Soil

Resource Investigations delineation in all areas where it was done and North State Resources delineation in the remaining areas. Impacts are based on this composite delineation. No wetland areas were identified in this study.

The following references were consulted to prepare the wetland portions of this section: U.S. Fish and Wildlife Service National Wetlands Inventory Maps, (Adin S.W., Alturas S.E., Silva Flat Reservoir, and Said Valley quadrangles); Soil Survey of the Hayden Hill Area, (USSCS 1990a); Hydric Soils List, Big Valley Soil Survey Area, (USSCS 1988); Topsoil, Vegetation and Wildlife at Hayden Hill, California, (Bio-Resources 1990a); Materials Resource Inventory, Hayden Hill, Lassen County, California, (Jensen and Dean 1990); Plan of Operations for the Hayden Hill Gold Venture, (HHOC 1989a); Scoping Evaluation for the Hayden Hill Project EIR/EIS (SRK 1990); Plant and Animal Survey of the Willow Creek Powerline Corridor, (Bio-Resources 1990d, 1991c); and the Federal Manual for Identifying and Delineating Wetlands (USACE 1989).

In order to keep the size of the document to a minimum, study methods are not presented. Those readers requiring this information are referred to the sources cited above which are on file with the Lassen County Planning Department.

3.4.1 General Description

The vegetation at the Hayden Hill site can be divided into five major types as shown on Figure 3.4-1 (Bio-Resources 1990e). These are Low Sagebrush, Upland Shrub, Jeffrey Pine/Mountain Shrub, Grassland and Wetlands. These are naturally occurring vegetation types in the area of Hayden Hill. Jeffrey Pine/Mountain Shrub vegetation occurs on the top and northern slopes of Hayden Hill, while Upland Shrub and Low Sagebrush vegetation occurs on the southern slopes and flats below, respectively. A small heap leach pad, abandoned in 1987, which was not covered with growth media or revegetated has been naturally colonized by a different vegetation type. Grassland vegetation represents a distinct vegetation type and occurs throughout the Project area. Another vegetation type identified at the Hayden Hill site is Wetlands or riparian habitat. Wetlands are discussed in Section 3.4.2.5 and shown on Figure 3.4-3. The species present in the Preston Canyon, Bunselmeier Spring and access road corridors were identified and listed, however, these areas were not divided into separate vegetation types. They are dominated primarily by Jeffrey Pine/Mountain Shrub vegetation. Most of the vegetation types locally occupy previously disturbed soils. The slopes of Hayden Hill have been mined, explored, prospected and grazed almost continuously, since 1869.

The vegetation of the Snag Hill area is predominantly Greenleaf manzanita. The Manzanita shrub vegetation provides a cover of approximately 30 percent and the understory provides a cover of approximately 10 to 15 percent, for a total cover of approximately 40 to 45 percent. Remnants of Curl-leaf mountain mahogany indicate a recent fire in the area. The vegetation of the area is shown on Figure 3.4-2. The area of the proposed fire tower was burned in 1977 (Gerig Burn) and has been replanted in stages. The surrounding area was replanted by the USFS in 1981. The immediate area of the new fire lookout was not replanted because the area was considered unsuitable for replanting.

The saddle between the two peaks of Snag Hill consists of Jeffrey pine/sage/grass vegetation. This vegetation type is dominated by re-invading Jeffrey pine, Big sagebrush, and Wheatgrass. Wyethia/grass and Bitter cherry occur along the proposed access road. Total plant cover along this route approaches 40 to 55 percent.

The vegetation along the power line corridor varies from Jeffrey pine and Juniper woodland within Willow Creek Canyon to Low sagebrush and grass in the agricultural areas near Adin.

Special or Unique Species

No threatened or endangered species were found to occur within the site boundary of the Hayden Hill Project. However, four species of concern were identified. These species are; *Ivesia paniculata*, *Draba douglasii* (Douglas' draba), *Happlopappus lanuginosus* (Wooly goldenweed) and *Antennaria flagellaris* (Creeping pussytoes). *Ivesia paniculata* (delisted from candidate CAT-2 list in February 1990) was not found to occur within the detailed study area and is no longer considered a sensitive plant by the BLM. Five populations of *D. douglasii* (California Native Plant Society [CNPS] list 4; watch list) were located in Section 1, T36N, R9E. These populations will be impacted by Project activities, however, this species occurs in numerous populations in the area and no special consideration is required. *Happlopappus lanuginosus* may qualify as threatened and endangered under the California Environmental Quality Act (CEQA) since only two populations have been identified in California. *H. lanuginosus* occurs in Section 6 T37N, R10E and will not be impacted by Project activities. (Bio-Resources 1989a, b, and 1990b, d)

The Draft Modoc National Forest Plan lists the following plants as threatened, endangered, sensitive and/or Management Indicator Species (MIS) which may be found in the Big Valley Ranger District: *A. flagellaris; I. paniculata; Calochortus longebarbatus; Eriogonum prociduum; and Mimolus pygmaeus*. The first two species are discussed further in this section. The remaining three species were not found in any of the site studies and are not believed to occur within the Project site boundary.

Antennaria flagellaris, though not formally listed as a sensitive plant by the CNPS or the California Department of Fish and Game (CDFG), California Natural Diversity Database, qualifies as a special status species under CEQA, since it is believed to have limited populations in California. However, no formal petition for its inclusion on this list has been submitted. Only one population of *A. flagellaris* was known to exist in the Hayden Hill area prior to November of 1989. Presently, 54 populations are known to exist in the state. Three populations are known to exist in the area of Hayden Hill (Figure 3.4-1). However, only two groups located at the site are subject to impact.

The primary population of *Antennaria flagellaris* at the site occurs in the area of the proposed heap leach pad for the Project (see Figure 3.4-1). Several attempts, with very limited success, have been made to transplant parts of this population to surrounding areas by BLM botanist, Gary Schoolcraft. These attempts were made due to concern about the livelihood of the population in the midst of such an area of mineralization. Lassen Gold Mining, Inc. has undertaken studies to determine preferential habitat for *A. flagellaris* and the genetic similarities of the California plants to known populations in Oregon which could be transplanted to this area. During these studies, in November 1989, 54 new populations of *A. Flagellaris* were discovered and mapped. Based on the finding of additional similar populations and the positive results of the studies, indicating genetically suitable transplant specimens and proper habitat are available, the significance of the impact to this species is considerably reduced. Further research (Bio-Resources 1991c) has identified significant populations located in easy access areas and adjacent to roadways. Large tracts of land remain unsearched. If the area searched and numbers found are correlated to the available habitat unsearched, the population is estimated to be quite large. In addition, another population of equal size and density was located near Silva Flat. The impact to this species is insignificant based on the present research.

No threatened, endangered, sensitive or special status species of any kind were observed at the Snag Hill site (USFS 1990b). No threatened, endangered, sensitive or special status species were observed during the power line corridor studies. The power line corridor was surveyed in September of 1990 and May 1991 (Bio-Resources 1990d, 1991c).

3.4.2 Vegetation Type Descriptions

The following section describes the vegetation types identified at Hayden Hill. A species list is included in Appendix F which lists the species identified at the Project site. A corridor species list is also included in Appendix F, which lists the species encountered along the Bunselmeier Spring, Preston Canyon, and Hayden Hill Road corridors. In addition, Appendix F includes species lists for the Snag Hill area and the power line corridor. Cover density, species richness and diversity values were obtained from the studies completed by Bio-Resources (Bio-Resources 1989a, b and 1990a, b, c, d, e, f). These reports are on file at the Lassen County Planning Department for review.

3.4.2.1 Low Sagebrush

The Low Sagebrush vegetation type includes sparse Western juniper as the sole component of the tree layer and Low and Big sagebrush as the sole components of the shrub layer. The remainder of the vegetation was composed of grasses and forbs, including both perennial and annual plants (see Species List, Appendix F). Cover was estimated at 30 percent vegetation, 21 percent litter, 16 percent bare ground and 33 percent rock. Perennials made up 15 percent of the vegetational cover. Species richness and diversity are 7 and 1.41, respectively. Species richness and diversity for the perennial segment of the vegetation are 3 and 0.88, respectively. Approximately 647 acres are dominated by Low Sagebrush vegetation within Sections 1, 6, 31 and 36.

Low Sagebrush vegetation was found to be typical of the low lying, duripan soil, flatter areas on the south side of the site which are dominated by grasses, forbs and an occasional Western juniper, primarily in Section 1 (Figure 3.4-1). The Low Sagebrush vegetation plots contained the fewest species of the three main vegetation types. However, the species diversity was highest in this vegetation zone. The Low Sagebrush vegetation included a large number of grasses and forbs which occurred in most of the plots sampled. Though fewer species occurred overall, more species occurred in each plot than did in the other vegetation plots. The vegetational architecture for the Low Sagebrush community is consistently grasses, low sagebrush and forbs with sparse clumps of Big sagebrush and occasional Western juniper trees. The habitat value of this vegetation type is high due to the forage and grazing values of the vegetation. This habitat and vegetation type is commonly associated with duripan soils. Dominant plant species ranked by frequency, cover, and density are shown on Table 3.4-1.

Eroded areas comprise a very small portion of the Low Sagebrush vegetation type and are considered a subtype. Eroded areas are characterized by a high percentage of bare ground and rock, and a low percentage of vegetation cover. Approximately 94 acres of Eroded, Low Sagebrush vegetation occurs within the four Section area.

3.4.2.2 Upland Shrub

The Upland Shrub vegetation type includes both Western juniper and Jeffrey pine trees, all shrubs shown on the species list (Appendix F) except Woods rose, Elderberry and Greenleaf manzanita, and a wide variety of perennial and annual grasses and forbs. A few sedges and rushes were also collected within this vegetation zone. Cover was estimated at 44 percent vegetation, 31 percent litter, 8 percent bare ground and 17 percent rock. Perennials contributed 8 percent of the total vegetational cover. Species richness and diversity for all species is 5 and 1.06, respectively. Species richness and diversity for the perennial component of the vegetation is 3 and 0.92, respectively. The density of the perennial population is 8 plants per 0.25 m^2 plot. Squaw carpet was the most dense species, at 1,549 plants per acre (ppa), closely followed by Big sagebrush at 1,090 ppa. Jeffrey pine and Western juniper trees are equal in density at 36 ppa. Rabbit brush and Curl-leaf mountain mahogany have densities of 523 ppa and 270 ppa, respectively. Approximately 771 acres of Upland Shrub vegetation occur within the study area boundary.

TABLE 3.4-1

PLANT SPECIES RANK BY FREQUENCY, COVER, AND DENSITY FOR VEGETATION TYPES AND ABANDONED HEAP LEACH PAD AT HAYDEN HILL DURING JUNE 1989 (BIO-RESOURCES 1990E)

Vegetation Type	Frequency, % (Rank)	Cover, % (Rank)	Density, No./ha (Rank)
LOW SAGEBRUSH			
Poa secunda	90 (1)	4 (2)	29 (1)
Artemisia arbuscula	60 (2)	16 (1)	3 (4)
Sitanion hystrix	35 (3)	1 (5)	3 (5)
Haplopappus stenophyllus	30 (4)	1 (3)	5 (3)
Trifolium macrocephalum	18 (5)	<1	2
Antennaria dimorpha	15 (6)	1 (6)	2 (6)
Antennaria flagellaris	10	<1	8 (2)
Eriogonum sphaerocephalum	2	1 (4)	<1
UPLAND SHRUB			
Sitanion hystrix	47 (1)	1	6 (1)
Artemisia tridentata	40 (2)	13 (1)	2
Poa sp.	28 (3)	1	6 (2)
Festuca idahoensis	27 (4)	2 (4)	3 (3)
Agropyron spicatum	23 (5)	1	2
Ceanothus prostratus	15	5 (2)	2
Ribes cereum	3	3 (3)	<1
Prunus virginiana	5	2 (5)	<1
Elymus glaucus	20	1	3 (4)
Stipa thurberiana	17	1	2 (5)
JEFFREY PINE/MOUNTAIN SHRUB			
Sitanion hystrix	53 (1)	1 (3)	7 (1)
Festuca idahoensis	28 (2)	2 (1)	4 (2)
Lupinus caudatus	17 (3)	1	1
Amelanchier alnifolia	13 (4)	2 (2)	1 (4)
Hieracium sp.	13 (5)	1 (4)	2 (3)
Balsamorhiza sagittata	8	1 (5)	<1
Achillea millefolium	7	<1	1 (5)

TABLE 3.4-1 (continued)

PLANT SPECIES RANK BY FREQUENCY, COVER, AND DENSITY FOR VEGETATION TYPES AND ABANDONEDHEAP LEACH PAD AT HAYDEN HILL DURING JUNE 1989 (BIO-RESOURCES 1990E)

Vegetation Type	Frequency, % (Rank)	Cover, % (Rank)	Density, No./ha (Rank)
GRASSLAND			
Native Grassland			
Poa secunda	90 (1)	4 (2)	29 (1)
Sitanion hystrix	35 (3)	1 (5)	3 (5)
Haplopappus stenophyllus	30 (4)	1 (3)	5 (3)
Trifolium macrocephalum	18 (5)	<1	2
Antennaria dimorpha	15 (6)	1 (6)	2 (6)
Eriogonum sphaerocephalum	2	1 (4)	<1
Planted Pasture Grassland			
Medicago sativa	90 (1)	28 (1)	29 (1)
Agropyron intermedium	45 (2)	1 (4)	3 (2)
Wyethia mollis	20 (3)	2 (3)	1
Lomatium sp.	20 (4)	<1	1 (5)
Crepis modocensis	10 (5)	1	2 (4)
Lupinus caudatus	5	2 (2)	1
Poa sp.	5	1 (5)	<1
Sitanion hystrix	10	<1	2 (3)
WETLAND			
Poa sp.	80 (1)	8 ± 9 (3)	-
Juncus sp.	70 (2)	14 ± 16 (1)	-
Carex sp. & Poa sp.	20 (3)	12 ± 24 (2)	-
Achillea millefolium	20 (4)	2 ± 4 (4)	-
Hordeum brachyantherum	20 (4)		-
Ranunculus glaberrimus	20 (5)	2 ± 4 (4)	-
		<1 (5)	

TABLE 3.4-1 (continued)

PLANT SPECIES RANK BY FREQUENCY, COVER, AND DENSITY FOR VEGETATION TYPES AND ABANDONED HEAP LEACH PAD AT HAYDEN HILL DURING JUNE 1989 (BIO-RESOURCES 1990E)

Vegetation Type	Frequency, % (Rank)	Cover, % (Rank)	Density, No./ha (Rank)
ABANDONED HEAP LEACH PAD			
Chrysothamnus nauseosus	50 (1)	5 (2)	128 (1)
Sitanion hystrix	38 (2)	1 (3)	4 (3)
Ribes cereum	25 (3)	7 (1)	<1 (4)
Eriogonum nudum	12 (4)	1 (4)	5 (2)
Eriogonum sp.	12 (5)	<1 (5)	<1 (5)

The Upland Shrub vegetation type contained the most species (124) and the highest vegetational cover percentage (44 percent) of all the vegetation types sampled. The vegetational architecture for this zone is grasses and forbs below large shrubs. The architecture can be considered one step more complex than the Low Sagebrush zone. Dominant species ranked by frequency, cover and density are shown on Table 3.4-1.

3.4.2.3 Jeffrey Pine/Mountain Shrub

The Jeffrey Pine/Mountain Shrub vegetation type includes Jeffrey pine and Western juniper trees, all of the shrubs on the species list (Appendix F) except Silver sagebrush, Rabbitbrush, Leptodactylon, Antelope bitterbrush, Gray horsebrush, and a large majority of the graminoids and forbs identified on-site. No Rush species were identified in this vegetation zone, although, at least one Sedge species was identified here. Cover in this vegetation zone was estimated at 17 percent vegetation, 73 percent litter, 4 percent bare ground and 6 percent rock. Species richness and diversity are 5 and 1.19, respectively for annuals and perennials. Species richness and diversity for the perennial component of the vegetation is 2 and 0.68, respectively. The density of perennials averaged 6 plants per 0.25 m^2 plot. Serviceberry had the highest density value of all species evaluated in the Jeffrey Pine/Mountain Shrub zone at 2505 ppa. Jeffrey pine was a distant second to Serviceberry in density at 405 ppa, followed by Big sagebrush at 243 ppa and Dessert gooseberry at 198 ppa. Approximately 296 acres of the study area are dominated by Jeffrey Pine/Mountain Shrub vegetation.

The Jeffrey Pine/Mountain Shrub vegetation may contain small areas of commercial timber at the Project site. Timber stands are considered to have commercial value if the productivity meets or exceeds 20 cubic feet of wood per acre per year of commercial coniferous tree species. Some areas of the Jeffrey Pine/Mountain Shrub vegetation meet this criteria. Approximately 17 acres of this vegetation type is on USFS land and an additional 88 acres is on BLM land. These areas, which total 105 acres, may be considered for harvest.

Jeffrey Pine/Mountain Shrub vegetation appears to be common to the higher, north facing or wetter areas while Upland Shrub vegetation occupies a similar but south facing and dryer niche (Figure 3.4-1). The Jeffrey Pine/Mountain Shrub vegetation has an architectural structure which is more complex than other vegetation types due to an increased prevalence of trees and larger shrubs as compared to the other zones. No "old growth" or mature forest stands have been delineated in the Project area. Trees over 11 inches diameter at breast height (dbh) are occasionally found here. This variance of height and size increases the habitat architectural diversity. The abundance of important forage species such as Serviceberry, Antelope bitterbrush, Curl-leaf mountain mahogany and Desert gooseberry also enhance the habitat status of this vegetation zone. Dominant species are ranked by frequency, cover and density on Table 3.4-1.

3.4.2.4 Grassland

The Grassland vegetation type is present in areas scattered throughout the study area, in small isolated patches and along most of the drainages. This category includes natural Grassland and planted pasture Grassland vegetation.

The natural Grassland vegetation is similar in species diversity and structure to the Low Sagebrush vegetation type. However, the Low Sagebrush component is reduced or lacking entirely. Approximately 125 acres are dominated by natural Grassland vegetation within the study area boundary.

The planted pasture Grassland vegetation includes occasional Western juniper trees, Low sagebrush, Big sagebrush and Rubber rabbitbrush shrubs, and Crested wheatgrass, Intermediate wheatgrass, Bluegrass, Squirreltail, Cheatgrass, Foxtail and Medusahead rye grasses. Forb development is very limited, although, alfalfa is present (Appendix F). The cover for this zone is estimated at 42 percent vegetation, 34 percent litter, 21 percent bare ground and 3 percent rock. Species richness and diversity is 4 and 0.80, respectively. Species richness and diversity for the perennial component of the vegetation is 2 and 0.47, respectively. Perennial vegetation density is 9 plants per 0.25 m^2 plot. Approximately 64 acres are covered by planted pasture Grassland vegetation.

Planted pasture Grassland vegetation is located in the southwest and the southeast corners of Section 1 (Figure 3.4-1), south of Hayden Hill. A discussion on the quality of this vegetation as a forage source for wildlife or domestic animals is included in the range discussion included in Section 3.11. Table 3.4-1 lists the species ranked by frequency, cover and density for the southeast planted pasture grassland. The southwest pasture is estimated to have a 57 percent cover of Intermediate wheatgrass and a number of other grasses and forbs comprising approximately zero to 2 percent additional cover.

3.4.2.5 Wetlands

As used in this section, the term wetlands indicates jurisdictional wetlands of the United States as defined in the Code of Federal Regulations (CFR) (33 CFR Parts 320 through 330). Federal jurisdictional criteria for waters and wetlands were applied to prepare this section. In the present context, the term wetlands includes natural ponds, artificial impoundments, perennial and intermittent streams, springs, seeps, and other lands where the water table is at or near the surface during at least seven days of the growing season and vegetation, soil and hydrology indicate a wetland vegetation type. The Corps of Engineers has performed a site visit and review of the delineation used for the preparation of this section. A letter of their concurrence with the delineation has been obtained and is on file with the BLM's Susanville office.

Five broad categories of wetlands were recognized in the field investigation. Figure 3.4-3 shows the wetlands at the Hayden Hill site. Intermittent and permanent streams are defined as water contained within identifiable channels. The stream banks in this area are very steep and the wetlands associated with the impacted stream channels are limited to the area covered by the high water mark. Willow Creek is approximately 10 feet wide at this point, while Indian Spring Creek is approximately two feet wide. Intermittent stream wetlands are limited to the high water area during flows. On average, the wetland is approximately one to two feet wide, with no associated wetland vegetation. These occur in the area of the waste rock dump and along the access road. Seeps and springs include Bunselmeier Spring, Indian Spring, and smaller springs on residual geomorphic surfaces. Also included in this category are the cluster of seeps found at the toe of the old tailings on the south side of Hayden Hill in the northeast quarter of Section 1; and the seep located in the southeast quarter of the northeast quarter of Section 1.

Stream terrace wetlands are depositional surfaces adjacent to active stream channels. Included in this category are portions of the floodplain/hydric soil association mapped by Jensen and Dean in 1990. This wetland type is extensive in the Preston Canyon area outside of Project impact areas.

Impoundments are wetlands created by blocking the flow of drainages and by excavating or diking small depressions of otherwise dry land. Most impoundments in the Project area were created to provide stock water or to provide water for earlier mining activities. Mine detention ponds are impoundments created for past mining activities which now remain as wetlands. They are located in the area of the proposed heap leach pad. The majority of the wetlands at the site are manmade impoundments of low value to wildlife or water quality.

Cover percentages for vegetation, litter, bare ground and rock are 64, 24, 12 and < 1, respectively, for wetlands vegetation. This vegetation type is dominated by Bluegrass, Rush and Sedge species. The top five species as ranked by frequency, cover, and density, are listed in Table 3.4-1.

3.4.2.6 Other Relevant Areas

Abandoned Heap Leach Pad

The abandoned heap leach pad, located in the north central area of Section 1 occupies approximately 1.4 acres and was abandoned in 1987. All vegetation currently inhabiting this heap is the result of natural colonization. The vegetation currently established on the abandoned heap leach pad includes Curl-leaf mountain mahogany, Rubber rabbitbrush, Antelope bitterbrush and Elderberry shrubs, Mountain brome, Kentucky bluegrass, Bluegrass spp., Squirreltail and Cheatgrass graminoids and a variety of forbs (Species List, Appendix F). The cover is estimated at 35 percent vegetation, 21 percent litter, 1 percent bare ground and 45 percent rock. The species richness and diversity is 4 and 1.00, respectively. The perennial component of the vegetation has a density of 39 plants per 0.25 m^2 plot. The species richness and diversity for the perennial segment of the vegetation is 2 and 0.34, respectively. The species are ranked by frequency, cover, and density on Table 3.4-1.

The abandoned heap leach pad community is irrelevant as a distinct vegetational type, but represents an example of the level of natural invasion which could be expected under similar conditions. Growth media was not placed over the spent ore and the area was not seeded. The small size of the area and its location in the middle of Low sagebrush vegetation suggest a strong border effect has taken place. Plants have invaded far enough in to cover the area but may not invade far enough in on a larger disturbance for the borders to meet and cover the entire area. At any rate, the invading species (Appendix F) should be considered for further study in the on-site revegetation trials since they have been successful here.

Curl-leaf mountain mahogany, Antelope bitterbrush, Mountain brome and Kentucky bluegrass are species commonly used in reclamation which are important forage species. Antelope bitterbrush is also a host plant for nitrogen fixing bacteria. Their success on the abandoned heap leach pad suggest reclamation may be successful on the remainder of the site. The high density of perennials indicate the plant community may be stable and self reproducing. Since the aspect, slope and soil will vary across the site these results may not be duplicated elsewhere, however, with the addition of growth media and the additional care a systematic reclamation plan will include, the indications are good for successful reclamation.

Bunselmeier Spring, Preston Canyon and Hayden Hill Road Corridors

The vegetation occurring in the Bunselmeier Spring, Preston Canyon and access road corridors was surveyed and recorded in the Corridor Species List which is included in Appendix F. The vegetation is a composite of Jeffrey Pine/Mountain Shrub, Upland Shrub, Low Sagebrush and meadow vegetation in all three corridors. Some wetland areas occur in each corridor; these are discussed above in Section 3.4.2.5. Jeffrey Pine/Mountain Shrub vegetation dominates the largest percentage of the area within the corridors.

3.5 Wildlife and Aquatic Biology

3.5.1 Wildlife

This section provides a description of the wildlife species and habitats in the Hayden Hill Project area. A species list of birds, mammals, and reptiles observed in the Project area, as well as benthic invertebrate collected in Willow Creek, is provided in Appendix G. A total of 88 species of birds, 21 species of mammals, and six species of reptiles were observed in or near the Project area during surveys of 1989 and 1990. Amphibians were not observed. This is not a complete list of all wildlife species that can be expected to occur in the study area; habitat is present for species which were not observed on site. In addition to the field studies conducted, the following sections also rely on input from agency biologists, literature and file information from the CDFG, California Natural Diversity Data Base (CDFG 1990b), California Natural Heritage Lands and Natural Areas Program; the U.S. Fish and Wildlife Service's (USFWS) Endangered Species office, the BLM and the USFS.

The study area includes everything within the site boundary but encompasses a slightly larger observation area and varies by species and habitat studied. Region and vicinity signify the use of regional information. Baseline studies of different intensities for different species and locations were conducted at the Project area, the Snag Hill area, and along the power line corridor by Bio-Resources in 1989 and 1990. (Bio-Resources 1990a, b, c, d, e).

3.5.2 Wildlife and Wildlife Habitat Types

As described in the vegetation section, there are five major vegetation types identified for the Project area: Low Sagebrush, Upland Shrub, Jeffrey Pine/Mountain Shrub, Grassland, and Wetlands. In this section on wildlife, the vegetation types and habitat types are used synonymously. On level and gently sloping land, grass meadow and Low Sagebrush are utilized by an assemblage of wildlife species typical of grasslands and shrub steppe of the Great Basin, including the sage grouse, pronghorn antelope, sagebrush lizard, and prairie falcon. Areas of 5 to 40 percent slope are vegetated with Upland Shrub and Jeffrey Pine/Mountain Shrub vegetation types; and are occupied by mountain and forest wildlife species such as the northern flicker, Steller's jay, Clark's nutcracker, mountain chickadee, and least chipmunk. A number of other wildlife species which typically range over both types are also present, and include the red-tailed hawk, turkey vulture, mule deer, coyote, and deer mouse. The Riparian or Wetland vegetation type is also a very important habitat type and is utilized at some point by most wildlife. Herbivores and water associated birds use the Wetland/riparian areas extensively.

Vegetation mapped at Snag Hill, located in the Gerig burn area, include Jeffrey pine, various sagebrush and grasses, and Greenleaf manzanita. Wildlife species resident at Snag Hill, include sparrows, horned larks, meadowlarks, Belding's ground squirrel, and deer mice. Mule deer were also observed in the Snag Hill area (Bio-Resources 1989a). The area is considered excellent summer range for deer by CDFG (CDFG Comment letter, 3-13).

Vegetation types along the power line corridor range from Jeffrey pine in Willow Creek canyon to Low Sagebrush and grass from County Road A2 toward Adin. Wildlife species observed include red-tailed hawks, Cooper's hawks, and mule deer. No nests were located within sight of the corridor (Bio-Resources 1990d).

Additional habitat features important to wildlife on the Project area include rock outcrops and open water (pond/reservoir). Rock outcrops provide habitat for small mammals such as the yellow-bellied marmot, ground squirrels, chipmunks, and wood rats; nesting and roosting habitat for raptors and other birds that use cliffs and rock outcrops; and potential roosting habitat for bats. Open water provides habitat for waterfowl and other water-associated birds, including shorebirds and marsh-dwellers such as red-winged blackbirds. The mapped vegetation is shown on Figure 3.4-1, and acreages are summarized in Section 3.4, Vegetation. These vegetation types and all wildlife species observed are described in detail in the report "Vegetation and Wildlife At Hayden Hill", (Bio-Resources 1990a, b, e). The topographic and vegetative diversity in terms of both structure and species, combined with the open water and rock outcrops, supports a variety of wildlife species typical of the region.

3.5.2.1 Birds

A total of 88 species of birds were observed in or near the Project area during field surveys in 1989 and 1990. A species list denoting abundance, residency status, and habitat where observed is provided in Appendix G. A total of 43 species of birds were found in the Jeffrey Pine/Mountain Shrub habitat, 33 in Grassland and Meadow habitat, 38 species in the Upland Shrub, 29 in Low Sagebrush, and 25 in the ponds and Silva Flat Reservoir. Special-status birds including Federally endangered and threatened species; California endangered, threatened, and species of special concern; as well as species of special concern to the BLM and USFS are discussed in Section 3.5.3.

The horned lark, vesper sparrow, and western meadowlark were the most common species in Low Sagebrush habitat. Mountain chickadee and Clark's nutcracker were common in Upland Shrub habitat. Clark's nutcracker, mountain chickadee, and Steller's jay were the most common species observed in the Jeffrey Pine/Mountain Shrub areas. Brewer's blackbird, American robin, mountain chickadee, brown-headed cowbird, and starling were the most abundant species in Meadow habitats in Preston Canyon. Waterfowl, shorebirds, and the red-winged blackbird were only observed in the pond/reservoir habitats, including Silva Flat Reservoir. Migratory waterfowl and other water-associated birds observed using the ponds to the south of the Project area and Silva Flat Reservoir, include the Canada goose, mallard, pied-billed grebe, white-faced ibis, and sandhill crane. Rock outcrops provided habitat for nesting and roosting of the turkey vulture, American kestrel, great horned owl, prairie falcon, rock wren, cliff swallow, and Townsend's solitaire.

3.5.2.2 Mammals

During field investigations by Bio-Resources (Bio-Resources 1990a, b, e), 21 mammal species were recorded in the Project area (Appendix G). In Upland Shrub, 15 species were recorded and the deer mouse and California kangaroo rat were the most common species trapped while the least chipmunk was most frequently observed during ground transects. In Jeffrey Pine/Mountain Shrub 16 species were observed; the most common during trapping were the least chipmunk, deer mouse, golden-mantled ground squirrel, and dusky-footed wood rat while the least chipmunk was the most common species observed during ground transects. Fifteen species of mammals were recorded in the Meadow vegetation sub-type, and the most common species recorded during trapping was the deer mouse. Few mammals were seen during ground transects. A total of 11 mammal species were found in Low Sagebrush vegetation, with the deer mouse most frequently trapped and Belding's squirrel most often seen during ground transects. The Low Sagebrush and Meadow habitats were used by pronghorn. Wide-ranging carnivores such as coyotes and skunks were observed in all habitat types (Bio-Resources 1990a, b, e). A variety of rodents, including marmots, tree and ground squirrels, chipmunks, pocket gophers, kangaroo rats, mice, voles, and woodrats were either observed or live-trapped at the Project area. Smaller mammals known or suspected to occur include the coyote, bobcat, badger, striped skunk, cottontail rabbits, and flying squirrels. Large mammals suspected to occur in the area include the mountain lion and black bear. These species are typical of this habitat and location. Results of field surveys are presented in Bio-Resources (1990a, b, d, e).

Mule Deer

Information on deer was provided by CDFG (Hall 1990a, b) and the baseline studies were completed by Bio-Resources (1990a, b, c, d). According to CDFG records, Hayden Hill supports a density of approximately 20 deer per square mile, with up to 50 animals being observed in the study area. The area supports good quality summer range. Deer foraged in Upland Shrub and Low Sagebrush habitats on and near the Project area during late winter and early spring. Fawning apparently took place in open portions of Jeffrey pine and Upland shrub. Deer used all habitats during the fall, and during the winter used the ranges north and south of the Project area, unless driven to lower elevations by snow depths over 24 inches (Hall 1990b).

The Project is within the X3A Management Unit and the Adin Deer Herd, a herd of approximately 7,500 animals in an area of 1,400 square miles. The Project includes 4.4 square miles, or 0.31 percent of this unit. The area within a 2-mile radius of the Project comprises approximately 16 square miles or 0.94 percent of the unit. The area is also used by animals moving between summer and winter ranges. The northernmost part of the Project is near winter range mapped in the Adin Deer Herd Management Plan (CDFG, et al 1984). The average density of deer is six per square mile but the habitat is very heterogeneous and animals are concentrated in areas of higher quality habitat (Hall 1991).

Pronghorn Antelope

Pronghorn antelope occupy an area of about 9,000 acres of Low Sagebrush habitat in the vicinity of the Project during the spring, summer, and fall. There are 355 acres of this habitat type within the Project area. Meadow is important for pronghorn kidding and there are 35 acres of this type in the Project area.

The pronghorn habitat within a 2-mile radius of the Project is approximately 16 square miles, or 0.18 per cent of available habitat. The Project area includes portions of the Big Valley and Lassen Management units for pronghorn. (CDFG 1989) A State Game Refuge (a management area designation, not land ownership), established for the protection of pronghorn and sage grouse is located south and west of the Project. The area is a common summer range used by pronghorn that winter in the vicinity of Mud Flat and Big Valley, according to CDFG (Hall 1991). Large herds of 50 to 120 individuals are seen west of Silva Flat Reservoir by November of most years. Approximately 90 pronghorn have been counted in the area between Snyder Waterhole, Hayden Hill, and south to the Silva Flat Reservoir during aerial surveys in the summer by CDFG (CDFG 1989). Fawning occurs mainly in the flats around Silva Flat Reservoir (Hall 1990b). Part of the Project area is mapped as important pronghorn fawning habitat (the Low Sagebrush habitat) in the Areas of Special Biological Importance map (CDFG 1979, 1990a). In 1989 and 1990, 5 to 15 pronghorn were observed in the Project area during Bio-Resources baseline studies (Bio-Resources 1990a, b, c, d, e).

3.5.2.3 Other Species

Six species of reptiles were found in Low Sagebrush and four species were found in Upland Shrub habitats. The species observed are listed in Appendix G. No amphibians were found. Amphibians such as toads and frogs probably inhabit at least some of the open water habitats but these areas were not sampled by Grant (Bio-Resources 1990a, b, d, e).

3.5.3 Threatened, Endangered and Other Special-Status Species

Special-status wildlife species known to occur or to potentially exist either in the region or in the Project area are listed in Table 3.5-1. Included in this table is a summary of the Federal, California, BLM, and USFS status of each species, the likelihood that it occurs, and comments on suitable habitat, if warranted.

3.5.3.1 Bald Eagle

One Federal and State Endangered species, the bald eagle, was observed flying over the flats and reservoirs south of Hayden Hill during March 1990 field survey (Bio-Resources 1990b). Bald eagle nests have not been observed and are not documented in or adjacent to the Project area. A bald eagle nest has been documented on the Ash Creek Wildlife Area, 13 miles north of the Project area. There have been sightings of eagles over the flats, 7 miles north of the Project area. Bald eagles also nest along the Pit River, to the north of the Project area, and Eagle Lake, located 20 miles south of the Project. Reports were received during public scoping meetings that bald eagles have been observed using Snyder Waterhole as a feeding area for several years (1987, 1988, 1989), during the nesting season. This waterhole is very small and may occasionally provide waterfowl or waterbird prey to eagles, but is

TABLE 3.5-1

SPECIAL STATUS SPECIES OF POTENTIAL OCCURRENCE IN OR NEAR THE HAYDEN HILL PROJECT AREA

Status' given are Federal (US), State (CA), Bureau of Land Management (BLM) and Modoc National Forest Management Indicator Species (USFS MIS).

Species	Status	Occurrence & Comments
Federal Status		
Bald eagle	US Endangered CA Endangered	Observed foraging on site occasionally, no high quality nesting habitat.
Peregrine falcon	US Endangered CA Endangered	Not observed, no suitable nesting habitat, may occasionally occur as migrant or vagrant.
Modoc sucker	US Endangered CA Endangered	Not observed, suitable habitat may exist.
California spotted owl	US petition Threatened, California SSC(2) USFS, BLM sensitive	Not heard or observed during 1991 survey using USFS protocol, suitable habitat may exist.
Oregon or Sierra Nevada snowshoe hare	CA SSC CA SSC, US Category 2	Not observed, habitat marginal, likely to occur at higher elevations.
Spotted bat	US Category 2	Not observed, potentially suitable habitat surveyed, unlikely to occur.
Townsend's big-eared bat (possibly) or Pallid big-eared bat	CA SSC US Category 2	None observed, numerous colonies exist in Lassen County, likely to occur.
Sierra Nevada red fox	US Category 2 CA Endangered	Not observed, suitable habitat may exist.

NOTE:SSC(2,3) California Species of Special Concern.(Remsen 1978)

Level:
- 1 - faces immediate extirpation of its entire population or its California breeding population if current trends continue
- 2 - declining in abundance but in no immediate danger of extirpation
- 3 - not declining but requiring attention due to limited populations in California.

TABLE 3.5-1 (continued) SPECIAL STATUS SPECIES OF POTENTIAL OCCURRENCE IN OR NEAR THE HAYDEN HILL PROJECT AREA

Species	Status	Occurrence & Comments
State Status Endangered, Threatened		
Willow flycatcher	CA Endangered, USFS & BLM Sensitive	Not observed, suitable habitat does not exist.
Greater Sandhill crane	CA Threatened USFS MIS	Observed at Silva Flat Reservoir and at two ponds adjacent to the Project area, marginal nesting habitat exists in the study area, may have attempted to nest based on observations of pair through the summer of 1990.
White-faced ibis	CA SSC (1)	Pair observed 1 time in 1990 visiting pond, marginal nesting habitat exists.
Bank swallow	CA Threatened	Not observed, potential foraging habitat present.
Swainson's hawk	CA Threatened USFS MIS	Not observed, potential nesting habitat exists, may occur.
California Bighorn sheep	CA Threatened USFS sensitive	Not observed, no potential habitat.
Species of Special Concern		
Northern goshawk	CA SSC(3) USFS sensitive	Observed, suitable nesting habitat exists, may nest.
Northern harrier	CA SSC(2)	Observed hunting, potential nesting habitat exists.
Osprey	CA SSC(2) USFS MIS	Not observed, suitable habitat does not exist.
Sage grouse	CA SSC(2) USFS MIS	Two active leks, suitable nesting habitat, critical winter range exists within 1 mile of Project area boundary, 32 birds counted in August 1990, 20 in 1991.
Yellow warbler	CA SSC(2) USFS MIS	Not observed, no potential habitat.

NOTE:SSC(2,3) California Species of Special Concern.(Remsen 1978)

Level:
1 - faces immediate extirpation of its entire population or its California breeding population if current trends continue
2 - declining in abundance but in no immediate danger of extirpation
3 - not declining but requiring attention due to limited populations in California.

TABLE 3.5-1 (continued) SPECIAL STATUS SPECIES OF POTENTIAL OCCURRENCE IN OR NEAR THE HAYDEN HILL PROJECT AREA

Species	Status	Occurrence & Comments
Golden eagle	CA SSC(3) USFS MIS	Observed, potential nesting habitat exists, there are confirmed reports of nesting near Indian Springs.
Prairie falcon	CA SSC(3) USFS MIS	Observed, possible nesting attempt in 1990 on cliffs on north side of Hayden Hill, no young were observed.
Western white-tailed hare	CA SSC	Not observed, suitable habitat exists, may occur.
USFS Status		
Blue grouse	USFS MIS	Not observed, potential habitat exists.
Canada goose, Mallard	USFS MIS	Observed in Silva Flat Reservoir and smaller ponds in study area.
Mule deer	USFS MIS	Common resident except during winter, uses most habitats, winter range north of Hayden Hill.
Pronghorn	USFS MIS	Resident during all seasons but winter, using Low Sagebrush habitat.
Pileated woodpecker, Hairy woodpecker	USFS MIS	Not observed, potential habitat in Jeffrey pine vegetation.
Pine marten	USFS sensitive	Not observed, suitable habitat does not exist (high elev. mature dense forest).
Red-breasted and Red-naped sapsuckers	USFS MIS	Observed, suitable habitat apparently exists for red-breasted.
Western gray squirrel	USFS MIS	Observed in Upland Shrub and Jeffrey Pine/Mountain Shrub habitats.
Rainbow, brown, and brook trout	USFS MIS	Rainbow trout historically observed in Willow Creek, brown and brook trout not observed

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NOTE:SSC(2,3) California Species of Special Concern.(Remsen 1978)

Level:
1 - faces immediate extirpation of its entire population or its California breeding population if current trends continue
2 - declining in abundance but in no immediate danger of extirpation
3 - not declining but requiring attention due to limited populations in California.

unlikely to be an integral part of any pair's home range or forage base. Bald eagles hunt over large expanses of water or open country, preying on whatever is available, including sage grouse, but they prefer fish and waterfowl (Biosystems Analysis, Inc. 1985; Stalmaster 1987). The Silva Flat Reservoir and extensive open flats around it, including the flats south of Hayden Hill, may be hunted by foraging bald eagles.

3.5.3.2 Peregrine Falcon

The peregrine falcon, classed as Endangered in the U.S. and California, has not been observed but may occasionally occur. Migrating or post-fledgling peregrines may travel through the Hayden Hill area. They may be attracted to the Silva Flat Reservoir area during shorebird and waterfowl migration in the spring and fall, or they may hunt over the other open habitats in the study area. Suitable nesting habitat for peregrines (cliffs, usually over 100 feet high) does not exist in the Project area.

3.5.3.3 Modoc Sucker

The Modoc sucker is classed as Endangered in the U.S. and California. Modoc sucker are discussed in detail under Aquatic Biology in Section 3.5.4.1.

3.5.3.4 California Spotted Owl

The boundary between the northern and California spotted owl subspecies is the Pit River which lies approximately 20 miles north and west of Hayden Hill. This places Hayden Hill in the range of the California spotted owl. Spotted owls were not observed during nighttime bat and owl surveys – only great horned owls (and no bats) were detected. A survey strictly following the USFS protocol was conducted in May, June and July of 1991. During all monitoring sessions, no spotted owls were heard or seen (Bio-Resources 1991b). There is some evidence that great horned owls exclude spotted owls (Phillips 1978). There are recent records of spotted owl pairs occupying Jeffrey pine habitat in the vicinity, near Bogard Butte, which is located approximately 32 air miles south southwest of the Project, (Schultz 1988); and a single bird was found in the South Warner Mountains (northeast of the Project) in 1980 (Gould 1991). The California spotted owl is thus considered to be of possible but unlikely occurrence in the study area.

3.5.3.5 Snowshoe Hare

Range maps (Hall 1981) show the Project is near the boundary between the range of the Oregon and Sierra Nevada subspecies of Snowshoe hare. Thickets and riparian areas in higher elevation terrain are preferred. This species may occur in or near the Project area. The Sierra Nevada subspecies is Category 2 and both are Species of Special Concern (SSC) in California.

3.5.3.6 Bats

Spotted Bat

Consultation with the USFWS (1990) indicate the spotted bat may occur in the Hayden Hill area. The spotted bat is classified as Category 2 by the USFWS, which means existing information may warrant listing, but substantial biological information to support a proposed rule is lacking, e.g., additional information on the species is needed. Field surveys were conducted for at least two hours per night on three nights in late May and mid-June 1990, by Bio-Resources, when an observer listened for the audible call of the bat at potential roosting habitat in the rock outcrops on the north side of Hayden Hill and potential feeding habitat along the stream between Indian Springs and Willow Creek. A study was also conducted along the Highway 139 power corridor using a Mini-2 UltraSound Bat Detector. Bats were not heard, sighted, or detected during these surveys (Bio-Resources 1990b, d, e).

Townsend's Big-Eared Bat

The Project is also near the boundary between two Big Eared bat subspecies. The subspecies status of local animals, if they occur, is unknown. None were observed or detected during the Bio-Resources surveys. Outcrops, mine shafts, and caves are used as roosts and colonies. These features are numerous in the region. This species is considered likely to occur in the vicinity according to Pearson, a bat researcher at UC Berkeley (Pearson 1991).

3.5.3.7 Sierra Nevada Red Fox

The Sierra Nevada red fox is a California Endangered, US Category 2 recently listed species. The closest sightings (unverified) have been 11 and 17 air miles west-southwest of the Project area in the Dixie, Fall River, and Little Valley areas. This fox is thought to prefer high altitudes but has been seen in lower elevation meadow and meadow forest transitional zones (Turner 1991). No foxes have been observed in or adjacent to the Project area.

3.5.3.8 California Threatened Species

Information on sensitive wildlife species in the area was obtained from the California Natural Diversity Data Base (correspondence dated May 9, 1990). Migrating Swainson's hawks and/or bank swallows, classified as Threatened in California, may pass through the Project area occasionally but were not observed. California bighorn sheep are not scheduled for transplant anywhere in the Big Valley Ranger District. Suitable habitat does not exist, and it is very unlikely they could occur.

Greater Sandhill Crane
The greater sandhill crane, which is Threatened in California, appears to be a summer resident of the area. One pair of birds was detected in early August southwest of the Project area near the small stock pond in Section 11. A second pair was heard simultaneously from the area west of Silva Flat Reservoir, outside the study area. If the pair in Section 11 attempted to nest, they appear to have been unsuccessful as no chicks were seen in August, nor was any evidence of nesting found. Habitat for nesting sandhill cranes is poor except possibly at Snyder Waterhole, which is less than one mile from the proposed site boundary, and along the proposed water line routes. Cranes were observed in Section 11 in April of 1991, but had not been observed again until August 1991. The presence of the cranes, listed as Threatened by the State of California, required consultation with CDFG under the California Endangered Species Act. A Biological Assessment was prepared and submitted to CDFG in August 1991, and is on file with Lassen County (Sharp 1991). Consultation is discussed in Chapter 6.0; the results of consultation are included in Appendix N.

3.5.3.9 California Species of Special Concern (SSC)

Six species of concern in California were observed at or near Hayden Hill; the white faced ibis, SSC[1], faces immediate extirpation of its entire population or its California breeding population if current trends continue; the sage grouse, northern harrier (both second priority species, SSC[2], declining in abundance but in no immediate danger of extirpation), goshawk, golden eagle, and prairie falcon (third priority species, SSC[3], not declining but requiring attention due to limited populations) (Remsen 1978). The white-faced ibis was observed visiting a pond adjacent to the Project area in 1990. The western white-tailed hare, snowshoe hare, and yellow warbler were not observed within the site boundary. Their likelihood of occurrence is discussed below.

White-faced Ibis (SSC[1])
The white-faced ibis was observed on one occasion in 1990 visiting a pond adjacent to the Project area. None have been observed in 1991. This is a wading bird that likes flooded pastures, marshes and sloughs. Nesting occurs in flooded pastures and marshes. The nesting habitat is considered marginal in the area for this bird.

Northern Harrier (SSC[2])
The northern harrier was observed and is a second priority SSC in California. Suitable nesting habitat for northern harriers, which nest on the ground, is typically tall herbaceous vegetation 2-4 feet in height, usually in or adjacent to wetland areas. No northern harrier nests were found (Bio-Resources 1990a, b, d, e).

Sage Grouse (SSC[2])

Sage grouse are classified as a SSC (2), defined as typically declining in abundance but in no immediate danger of extirpation. A State Game Refuge was established in this area to protect habitat for sage grouse and pronghorn. The refuge is located south and west, adjacent to the Project (it is a management area only, not a land ownership designation). There are about 5000 acres of Low Sagebrush habitat in the region that grouse could range through. The sagebrush is often surrounded by forests and Juniper woodlands which have developed at least partly from the lack of fires in the past. The Juniper woodlands are replacing sagebrush habitat required by the grouse and may be barriers to grouse movement into and out of this area. Approximately 355 acres of Low Sagebrush habitat are impacted by the Project. This is one of two western-most populations of sage grouse in their range. Changes in vegetation, most notably Juniper encroachment, have affected the habitat base and there is less sage grouse habitat locally than was present when the refuge was established in 1917. Land use changes, particularly effects of grazing, have also affected habitat for grouse negatively. Overgrazing of meadow areas has been implicated in large scale declines of sage grouse in other western states.

California Department of Fish and Game records show historic lek (communal mating grounds where males strut or "dance" to attract females) count information from some years but population data are not available. The only known group of sage grouse in this entire area is centered in Sections 1 and 2, in the vicinity of the proposed mine. There are two sage grouse leks located in the southwest corner of the Project area in Section 1 in Low Sagebrush habitat. Another two leks were reported in Section 11, one by a local resident and one by Frank Hall (Hall 1990b). A total of 32 birds were counted near the leks in August of 1990. The lek locations are shown on Figure 3.5-1. Between 9 and 12 displaying males were counted at leks in April 1990. During daily observations in March and April 1991, lek attendance averaged 5 adult males. Overall, 20 grouse appeared to survive the winter with a loss of 1 male during breeding (Bio-Resources 1991a). Critical sage grouse winter range is located in Big Sagebrush habitat in the southwest corner (Figure 3.5-1). Robert L. Eng, an upland game bird expert from Montana State University, Bozeman, Montana, visited Hayden Hill and determined that Low Sagebrush habitat was summer and winter range for the grouse and the Upland Shrub habitat on the hill south of the proposed heap leach pad with its mixture of Big sagebrush and Antelope bitterbrush was critical winter range for grouse in the area (Bio-Resources 1990e).

Northern Goshawk, Golden Eagle, and Prairie Falcon (SSC[3])

There are historic reports of northern goshawk nesting in the study area. A golden eagle nest is located outside the access road corridor, near Indian Springs. All three birds are classed as third priority species, defined as not declining but requiring attention due to limited populations in California.

Goshawks have been observed in the Project area and it is likely they have nested in the vicinity. No nests were sighted during the 1989, 1990 or 1991 field studies or site visits. Goshawks nest in old growth and mature forest. Approximately 300 acres of mixed Mountain Shrub/Jeffrey pine exists in the Project area. No mature Jeffrey pine stands were mapped in the Project area, although large trees do occur. Mature forest has been identified by the USFS in the vicinity of the Project, near Letterbox Hill.

A golden eagle nest is located in a large pine near Indian Springs, a mile east of the Project area. Large pines are common in the area along the access road, the toe of the proposed waste rock dump, and along the Preston Canyon corridor. Goshawks and golden eagles typically have more than one nest and use alternate nests in succeeding years. Eagles in similar habitat in Wyoming have home ranges varying between 4 and 10 square miles, depending on prey base.

There has been one historical report of nesting prairie falcons in the area. A pair of prairie falcons were seen during the 1990 nesting season at the northwest corner of Hayden Hill on some cliffs approximately 30 feet high. The observations indicate no young were fledged from this possible nesting site. This may be an established pair with an alternate nest site elsewhere, or a new pair attempting to nest for the first time. Prairie falcons have not been observed during the spring and summer of 1991.

Western White-tailed Hare (SSC[3])
This large open-country hare or jackrabbit may occur in Low Sagebrush and Meadow habitats. These habitat types do occur in the study area, therefore, there is potential for their occurrence. None have been observed.

Yellow warbler (SSC[3])
This warbler prefers deciduous trees and shrubs in riparian areas. Suitable habitat does not exist on the Project area, therefore, this bird is unlikely to occur.

3.5.3.10 USFS Management Indicator Species and Sensitive Species

Sensitive species for the Modoc National Forest are goshawk, willow flycatcher, California bighorn sheep, and pine marten. Of these listed, only the goshawk has been observed in the Project area. MIS species which were observed in the Project area are the Canada goose, mallard, golden eagle, prairie falcon, sandhill crane, sage grouse, mule deer, pronghorn antelope, red-breasted sapsucker, red-naped sapsucker, and western gray squirrel. Other MIS species for the Modoc National Forest, which were not observed, include the osprey, Swainson's hawk, blue grouse, pileated and hairy woodpecker, and yellow warbler (see Table 3.5-1).

The BLM has no official sensitive or MIS designations like the USFS. The BLM follows USFWS and State-listed species for management practices.

3.5.4 Aquatic Biology

3.5.4.1 Fisheries

Fisheries issues relating to the Project center around the current and future status of *Catostomus microps*, the Modoc sucker, which is listed as a Federally endangered species under the Endangered Species Act of 1973. The Willow Creek drainage, which receives run-off from the Project site, is believed to be historic habitat for the Modoc sucker. Little survey work has been attempted since 1985 to document the current status of the population. Peter Moyle, an ichthyologist at University of California Davis who has written numerous papers on native fishes of California, indicates the Willow Creek Modoc sucker population has likely hybridized with the Sacramento sucker (*Catostomus occidentalis*), which entered the Willow Creek system in recent years (Moyle 1990). It is believed such hybridization has eliminated genetically pure Modoc suckers from the Willow Creek drainage. Recent work on other suckers in northeastern California suggest that the morphological differences could be environmental and that hybridization may not occur (BLM 1991).

Moduc suckers have very limited distributions and are found in only two sub-drainages of the Pit River. Willow Creek is considered a viable option as a site for recovery and expansion of Modoc sucker distribution through an action plan enacted in 1984 and approved by the CDFG, the Modoc National Forest, and the USFWS (USFWS 1984). Recovery of the species known habitat and expansion of the current range to other suitable areas is necessary to prevent its extinction. Five streams have been identified as Critical Habitat for Modoc sucker (Turner, Washington, Hulbert, Rush, and Johnson Creeks). Willow Creek is outside the Critical Habitat. Willow Creek was identified as a potential site to expand the current population and distribution of the Modoc sucker in the 1984 action plan.

Modoc sucker are similar to other *catostomid* species in some of their habitat preferences. They have been observed in pools of tributary streams and spawning has been observed in areas of small gravel substrates (Sato 1990). In previous studies, Modoc sucker have been found in streams characterized by low flows, large shallow pools with muddy bottoms, partial shade from trees, shrubs, or boulders, and moderately clear water (Moyle 1975).

The most recent fish survey work in Willow Creek was conducted by the USFS in May 1990 near the Willow Creek Campground and just downstream of the Hayden Hill Road crossing (USFS 1990c). This survey yielded Sacramento squawfish (*Ptychocheilus grandis*) and Pit sculpin (*Cottus pitensis*), which are common in the drainage, but no Modoc or hybrid sucker. A sucker (species unknown) was observed by CDFG in June 1991 just below the Hayden Hill Road (CDFG 1991). A July 1985 survey conducted by Peter Moyle found several hybrid sucker in Willow Creek above the Hayden Hill Road crossing (Moyle 1985). Prior to these more recent surveys, CDFG and USFS surveyed portions of the creek in 1977

(Ford 1977) and 1979 (USFS 1979), respectively. Both Modoc and hybrid sucker were reported in these surveys conducted in the vicinity of the Willow Creek Campground. The extent of hybridization was questioned during the 1979 survey. No fisheries data was found for reaches of Willow Creek directly below its confluence with Preston Canyon.

The fisheries data leaves questions about the current state of the Modoc sucker population in Willow Creek. Concern has been expressed by CDFG and USFWS that sampling could have a detrimental effect on the few Modoc sucker that may remain in Willow Creek. As a result of this concern, fisheries sampling was not conducted during the 1990 field season by Fishman Environmental Services (FES). Since the presence or absence of this fish cannot be established without extensive fish sampling, which would prove detrimental to any Modoc sucker population present, this EIR/EIS process will continue under the assumption that Modoc sucker are present. This assumption triggered Section 7 consultation with the USFWS. A Biological Assessment was prepared and submitted to the USFWS in July 1991 (BLM 1991). A discussion of the consultation process is provided in Chapter 6 of this document. The result of this consultation is in the Biological Opinion, included in Appendix N.

Other fish species occurring in Willow Creek, according to previous survey data, include Sacramento sucker, Sacramento squawfish, pit sculpin. Rainbow trout (*Oncorhynchus mykiss*) have been reported by local residents in Willow Creek downstream of the Project area, but have not been reported in fishery surveys. Fish were not observed in any of the intermittent drainages in the Project area.

3.5.4.2 Benthic Invertebrates

As an element of the aquatic biota, benthic invertebrates are important indicators of water quality as well as an important food source for fish. Water quality conditions must be favorable to sustain a balanced biological community. Changes in environmental conditions are often reflected in the composition of the invertebrate community over time. Biological impairment of the benthic community may be indicated by the absence of pollution-sensitive invertebrates of the orders *Ephemeroptera* (Mayflies), *Plecoptera* (Stoneflies), and *Trichoptera* (Caddisflies). A more detailed discussion of benthic community composition, the parameters used to evaluate the community structure, and how this information will be used to monitor future system health is presented in the Aquatic Resources Technical Report (FES 1991b).

Quantitative and qualitative invertebrate sampling was conducted by FES in five reaches of Willow Creek during July 1990 (Figure 3.5-2). The study results are discussed briefly in this section. Descriptions of sampling methodology and results are detailed in the Aquatic Resources Technical Report on file with the Lassen County Planning Department (FES 1991b).

A total of 57 taxa were identified in a total of 15 samples taken from the Willow Creek Campground downstream to below the gaging station (Figure 3.5-2). Most of the taxa are typical and widely distributed throughout the western United States. In addition, most of the taxa are also tolerant to extreme conditions such as siltation, high summer water temperatures, and enriched nutrient conditions. A taxa list and distribution checklist of invertebrates collected from Willow Creek is presented in Appendix G.

The overall diversity of invertebrate species in Willow Creek can be best characterized as low to moderate based on rapid bioassessment criteria established by the Environmental Protection Agency (EPA) (Plafkin, et al 1987). Diversity indices provide a measure of both the number of taxa and their relative abundance. Shifts in taxa richness, the number of taxa present in an area, and/or dominance are also good indicators of temporal changes in community health.

Streamflow was absent from the unnamed intermittent stream in the Preston Canyon drainage during the summer. Surface water was limited to discharge from a series of small springs located near its confluence with the Letterbox Canyon drainage. Benthic invertebrates were sampled in a shallow pool area with a grassy channel grazed by cattle. Invertebrate taxa observed at this location include water striders, diving beetles, water boatmen, midge larvae, and unidentified *Diptera* larvae.

The intermittent stream channels in the Indian Springs drainage were dry during 1990 field visits and consequently were not evaluated.

3.5.4.3 Stream Habitat Surveys

Willow Creek and the intermittent stream in the Preston Canyon drainage are the main watercourses draining the Study Area. Numerous small, ephemeral tributaries feed these larger systems within the study area. Several of the Willow Creek reaches surveyed during this study are located outside of the study area boundaries. These reaches, located in close proximity to Highway 139, are included to provide baseline data necessary to assess potential impacts from transportation of hazardous materials to the mine site. Stream survey data are presented in Appendix G.

Willow Creek is the main water course near the Project area. Five survey reaches along Willow Creek were selected to characterize the various habitat types present in the study area and bracket areas of potential environmental impact (i.e., above and below Willow Creek's confluence with the Preston Canyon drainage). Stream survey reaches corresponded with benthic invertebrate sampling stations (Figure 3.5-2). Approximately 500 feet of stream was surveyed at each station. Stream habitat data for each of the Willow Creek locations are presented in Appendix G. Detailed descriptions of stream survey methods and results are presented in the Aquatic Resources Technical Report (FES 1991) on file at Lassen County.

Stream habitat types in Willow Creek range from pools to high gradient cascades with plunge pools. Channel gradients range from approximately 2 to 4 percent for the five stations. Substrates at the furthest downstream station (WC-1) were primarily small materials such as gravels, sands, and silts (consolidated and unconsolidated). Embeddedness values were generally highest at the upstream stations (WC-4 and WC-5). Embeddedness was most prevalent in the flatter, slow-moving reaches. Instream cover such as woody debris, boulders, aquatic vegetation, and undercut banks was most prevalent at stations WC-1 and WC-4 which also had well developed riparian streambank cover. Riparian vegetation was lacking at the commonly grazed stations (WC-2, WC-3, and portions of WC-5).

The stream survey station in Preston Canyon, PC-1, consisted of an open vegetated (grasses and rushes) channel, with 100 percent coarse sand/fine gravel substrate. Banks along the stream are steep (approximately 2:1 slope) and downcut (approximately 10 feet) with sparse coniferous canopy. Cattle graze in the creek channel as well as in the sagebrush plant community adjacent to the banks.

A large portion of the Preston Creek drainage downstream from Hayden Hill is used for cattle grazing. As a result of this use, major portions of the unnamed creek are in a severely degraded condition, with the banks broken down and riparian vegetation stripped. Upland vegetation is also severely grazed in these areas.

3.6 Water Resources

This section describes the hydrogeologic environment of the following areas:

- The Preston Canyon area due north of the Project site;
- The Bunselmeier Spring area west of the Project site; and
- The Project site.

The data and analyses presented have been summarized from hydrogeologic and watershed study reports prepared by HSI, DKP, KP and FES.

3.6.1 Climate

The climate of the Hayden Hill area is arid to semi-arid, with low annual precipitation and warm temperatures. Representative area temperatures at Susanville, California range from -23°F to 105°F for the period 1951 to 1980, with an average annual temperature of 49°F (Gale Research Company 1985).

Winter temperatures in Susanville are assumed to be slightly higher than at the Hayden Hill site due to elevation differences. Susanville is at an elevation of 4,148 feet and the Hayden Hill site varies from 4,713 feet mean sea level (msl) in lower Preston Canyon to 6,300 feet msl at the top of Hayden Hill. Accounting for elevation differences between Susanville and the Project site, the average annual temperature at Hayden Hill is expected to be 42°F.

Precipitation at the Project site ranges between 14 to 16 inches per year with the majority falling as snow. Pan evaporative potential rates were measured at six stations in the vicinity of the Project site, and range from 33 to 53 inches per year at the individual stations (KP 1990a). The mean annual evaporation potential, which is the sum of the mean monthly evaporation rates of all stations, was calculated to be 57 inches. The greatest evaporation potential occurs in the summer months of June, July and August.

The growing season at the Hayden Hill site is approximately 50 to 80 days (White 1990b). The site is usually frost free from the end of May or the beginning of June to late August or early September.

3.6.2 Surface Water

The Hayden Hill Project area influences two drainages of the Willow Creek watershed; the Preston Canyon drainage (5,925 acres) and the Indian Spring drainage (4,174 acres) (FES 1991a). Figure 3.1-1 illustrates the area of these drainages and the further divided minor sub-basins.

The slopes surrounding the Indian Spring drainage vary in elevation from 6,650 feet at the southeastern end near Four Pine Spring to 5,000 feet at the northern end of the Indian Spring drainage. The Preston Canyon drainage elevation varies from a maximum of 6,300 feet to 5,000 feet in the canyon bottom.

Streams within the two drainages are fed by natural springs and precipitation. Indian Spring drainage is fed by Dago Spring, Daisy Dean Spring, an unnamed spring and Indian Spring on a year round basis. Preston Canyon drainage flow is ephemeral and primarily the result of precipitation events.

Both the Indian Spring drainage and the Preston Canyon drainage discharge into Willow Creek (Figure 3.1-1). Surface waters in both drainages generally flow to the north.

The Project will also influence the unnamed drainage (6,820 acres) extending southwest from Hayden Hill toward Silva Flat Reservoir. This drainage varies in elevation from a maximum of 6,300 feet to 5,600 feet at Silva Flat Reservoir. Included within the drainage are Dillon Lake and Snyder Waterhole. The drainage is unconfined; there is no single, common, well-developed channel. Silva Flat Reservoir discharges into the East Fork of the Juniper Creek watershed.

3.6.3 Groundwater

The emphasis of the following discussion is to describe the hydrogeologic characteristics relating to groundwater extraction from the Bunselmeier Spring and Preston Canyon production wells. Water supply requirements will be met by using wells drilled near Bunselmeier Spring. A water well in Preston Canyon will be used as a back-up supply. The Bunselmeier Spring well is located approximately three miles west of the Project site. The Preston Canyon well is located approximately four miles north of the Project site.

The Applicant has submitted three reports addressing the hydrologic characteristics at the site. Two of the reports, written by HSI (1990a,b), analyze the pump tests at the Bunselmeier Spring and Preston Canyon production wells. The third report, written by DKP (1990f), addresses the overall site hydrogeology.

3.6.3.1 Bunselmeier Spring Hydrogeologic Conditions

Aquifer Characteristics

The groundwater producing hydrogeologic sequence encountered at Bunselmeier Spring consists of a thick sequence of basalt and dacite with interbedded sedimentary rocks, tuff and clay zones. The volcanic rocks are highly fractured with local quartz veining and possible interbedded siltstones. Flow breccias were also encountered with green clays near total depth (HSI 1989a).

Local Perched System

To the west of the Project area, on the basalt plateau where Bunselmeier Spring is located, the topographic relief is slight and few springs exist. Local groundwater is thought to percolate downward, until it is stopped by either a low permeability horizon forming a perched system or recharges the deep regional groundwater surface. Then the water moves laterally through subsurface fractures and permeable zones, eventually discharging to Big Valley to the northwest.

Bunselmeier Spring was monitored during drilling and pump testing operations. The spring was not flowing during this time, but was surrounded by saturated soil throughout pump testing. This data indicates the spring is not part of the deep regional groundwater system, but is a local perched groundwater zone.

Recharge in the Bunselmeier Spring area occurs mainly due to precipitation in the higher topographic regions to the south and southeast. Surface water infiltrating and intercepting the secondary porosity features, such as faults and fractures, most likely recharges the regional groundwater system at depth.

Deep Regional System

Figure 3.6-1 presents the generalized potentiometric surface in the Bunselmeier Spring area. Regional hydraulic gradient is to the northwest.

The overall saturated thickness of the aquifer near Bunselmeier Spring can be estimated from exploratory drilling logs from HSI (1989c). A conservative estimate of the overall saturated thickness is approximately 400 feet.

The exploratory drilling logs (HSI 1989a,b,c) noted a persistent confining layer of basalt with interbedded tuffs. The small drawdown in observation well WTH-2B and data collected during the 72-hour pump test indicate that the system is unconfined. However, drilling data and previous site experience suggest the system may be confined (HSI 1990b).

Hydraulic parameters determined from the pump test data at PW-2B are as follows (HSI 1990b).

• Specific Capacity	7.58 gpm/foot
• Transmissivity	7,917 gpd/foot
• Storage Coefficient	1 x 10^{-3}

The parameters estimated in Section 3.6.3.2 for the Preston Canyon area will be used for the Bunselmeier Spring evaluation.

3.6.3.2 Preston Canyon Hydrogeologic Conditions

Aquifer Characteristics

The Project is regionally located on the southern edge of the Big Valley drainage basin, near the drainage divide with the Madeline Plains drainage basin. The Project area is a recharge area with groundwater moving to the northwest toward Big Valley.

The primary hydrogeologic groundwater source unit encountered in Preston Canyon is an alternating sequence of volcaniclastic, pyroclastic breccia, non-welded tuff and lava. The lava is fairly homogeneous, consisting of either dark gray, purple, or red, aphanitic to locally porphyritic, dense, hard rock, with local fracture zones occurring primarily at the upper and lower margins of the flows. The lava is of intermediate composition, probably a dacite.

The groundwater in the area is divided into two systems: 1) A shallow perched system; and 2) a deeper regional system. Many small springs discharge locally and are most likely part of a shallow perched water system. Lower McBride Spring is the largest regional spring near the site with an estimated flow of 150 gallons per minute (gpm).

Local Perched System

The shallow perched system is characterized by small seeps and springs which occur at relatively high elevations, significantly above the regional groundwater table. Evidence from water supply exploratory drilling indicates that this perched system is locally derived and is of limited supply. The seeps and springs in the area usually occur at the contact between geologic units of contrasting permeabilities, such as at the base of the dacite flows and the top of tuffaceous units. Due to the sub-horizontal orientation of the volcanic units, many of the seeps and springs occur along the same relative elevation.

In Preston Canyon, small springs and seeps occur in the upper canyon with no measurable discharge to the drainage during most of the year. Recharge occurs primarily in the upper canyon area as surface water percolates into the colluvium and volcanic bedrock beneath the canyon and occasionally resurfaces down-canyon in the drainage as small non-flowing pools. Surface water moves both vertically downward and down-canyon, where it discharges at the canyon confluence with Willow Creek or recharges the regional groundwater system at depth.

Deep Regional System

The groundwater gradient in the regional groundwater system is to the northwest across the site. Figure 3.6-1 presents the approximate groundwater elevation contours (potentiometric surface) of the regional groundwater system based upon gradients estimated from field data. Due to the complexity of faulting and interlayering of geologic units with differing permeabilities, the groundwater level elevations measured in wells near Hayden Hill show anomalous elevations when compared to the regional surface.

Figures 3.6-2 and 3.6-3 present hydrogeologic cross-sections across the site. The cross-section illustrates the complex relationship between the water table and the site geology. The cross-section indicates that the pit excavation may intercept the local shallow perched groundwater system but not the deep regional groundwater system.

The producing aquifer in the volcanic lava sequence of the Preston Canyon area may be characterized as follows:

- Hydrogeologic properties of the volcanic sequence vary vertically and horizontally due to the increase in hydrothermal activity, faulting, and mineral alteration in closer proximity to Hayden Hill;

- The overall saturated thickness of the aquifer is greater than 300 feet, although the effective thickness for water availability is probably less due to the lower transmissivities of interbedded volcanic zones.

A persistent confining layer of interbedded volcaniclastics, tuffs, and pyroclastic breccias overlies the regional groundwater system. A long-term 72-hour pump test indicated, by a characteristic transmissivity and storage coefficient, that the system is hydraulically confined (HSI 1990a).

Hydraulic parameters determined by the aquifer test performed at well PW-3D, completed in the lava sequence of the Preston Canyon area, are as follows (HSI 1990a):

• Specific Capacity	72 gpm/foot
• Transmissivity	121,557 - 164,777 gpd/foot
• Storage Coefficient	1.3×10^{-3} - 7.1×10^{-4}
• Permeability	1×10^{-4} cm/s

Some parameters had to be estimated based on known site geology and past field experience. The permeability estimate was based on field tests performed by KP (1990a). Parameters estimated from available data but not determined through specific laboratory or field tests are:

• Hydraulic Gradient	0.07 feet/foot
• Hydraulic Conductivity	1×10^{-1} gpd/foot^2
• Porosity	0.30

3.6.3.3 Groundwater Flow Rates and Quantities

Groundwater flow velocity through the regional groundwater system in both the Preston Canyon and Bunselmeier Spring areas is estimated to be approximately 7 feet per year based on gradients shown in Figure 3.6-1 and hydraulic conductivity (permeability) presented in Section 3.6.3.2.

This flow velocity indicates a total potential flow through the Bunselmeier Spring area is approximately 1,800 acre-feet per year, assuming a saturated thickness of 400 feet and groundwater basin width of five miles. Basin width was conservatively estimated using Juniper Road as the eastern boundary and Summit Spring as the western boundary of the basin. The actual basin width is probably larger, suggesting a potential for greater groundwater flow through the area.

Total potential flow through the Preston Canyon area of approximately 1,050 acre-feet per year, assuming a saturated thickness of 300 feet and a groundwater basin width of four miles. Basin width was conservatively estimated using Willow Creek as the eastern boundary and Juniper Road as the western boundary of the Project site. The actual basin width which is probably larger, would suggest a potential for greater groundwater flow through the area.

3.6.3.4 Spring Flow Rates and Quantities

According to field data presented by DKP (1990e), there are six springs located within the Project boundary which demonstrate observable flow.

Three of the springs are located in Letterbox Canyon. These springs are unnamed. Although surface flow had saturated the ground, flow volumes were not large enough for measurement.

The other three springs are located along Hayden Hill Road. Daisy Dean Spring has an estimated average flow of 1 to 2 gpm. An unnamed spring in the same drainage has an estimated seepage rate of 1 gpm. Indian Spring has an estimated average flow of 3 to 5 gpm.

These flow observations were made by KP in August of 1990. The flows from these springs subside to negligible volumes during the dryer summer months and in some cases dry up completely.

3.6.4 Water Balance

Presently, groundwater in proximity to the Project site is not being extracted in any large quantities. Therefore, it may be assumed that the area is currently in a condition of natural groundwater equilibrium.

3.6.5 Water Quality

Baseline water quality data for surface drainages, wells and springs in the Project area are currently being collected by LGMI. Figure 3.1-1 shows the locations of the surface water sampling points and Figure 2.2-6 shows the groundwater monitoring well sampling locations.

In general, the data indicate that groundwater in the area is of good quality, suitable for drinking or industrial use, meeting most of the U.S. EPA and California Primary and Secondary drinking water standards (DKP 1990e). There are some surface and groundwater iron occurrences which are above drinking water standards. Exceedences of standards are slight and occur due to existing natural geologic sources (DKP 1990e). Water quality data collected to date are on file with the Lassen County Planning Commission and the Regional Water Quality Control Board.

3.7 Air Quality

Air quality in the Project area is described in terms of both the dispersive capacity of the atmosphere and the ambient concentrations. In this discussion it is the area within about a two mile radius of the mine that is of interest. The effects to the air will be greatest where the mining and milling activity is taking place, and will decrease rapidly with distance. Beyond about a two mile radius there should be essentially no effect from the mine.

The ambient concentrations of the urban and industrial pollutants (carbon monoxide [CO], sulfur oxides [SO_X], hydrogen sulfide [H_2S], lead [Pb], and most toxics) are negligible because of the distance of the Project site from industrialized areas. There are measurable concentrations of fugitive particulates (PM10) from natural causes such as wind on roads and other exposed dirt surfaces. Ozone (O_3) concentrations are expected to be near their natural background levels.

3.7.1 Dispersion Meteorology

The elevation of the Project area ranges from 4,300 to 6,300 feet. The mountain ridges in the Hayden Hill area are on a north-northwest to south-southeast axis. West and north of Hayden Hill, the Preston Canyon drainage drops at a relatively steep eight percent grade to the north-northwest (Figure 3.7-1). South and east of Hayden Hill, the Indian Springs drainage drops at about a six percent grade, paralleling the Hayden Hill Road to Willow Creek and on to the northwest. Under very stable atmospheric conditions the surface air over the mine will drain on these routes and therefore, emissions from the mine into the air should not concentrate. Under less stable conditions there will be no drainage down the canyons but considerably better vertical mixing of the surface air containing mine emissions, and a deeper atmosphere through which to mix. Under the less stable conditions the winds will follow the patterns defined by the measurements described below.

Dispersion meteorological data is being collected on the Project site at the location shown on Figure 3.7-1. Data collection began in late March 1990, and 239 days of data are available for analysis (Percivalle 1990a). Table 3.7-1 and Figure 3.7-2 show the frequency distribution of winds by direction and speed. Table 3.7-2 lists the frequency of winds by direction and stability. Thirty-one percent of the winds blow from northwest through north, three of the 16 sectors, more than any other directions (Table 3.7-1). The next most frequent wind direction is from the three sectors of southeast through south, totaling almost 29 percent of all winds. Average all-day speed is 5.6 knots (6.4 miles per hour). Nearly all the winds from the north, the predominant direction, are relatively low speed winds with an average speed of 4 miles per hour. The winds from the south are much faster and average 8 miles per hour. The northern winds occur day and night, under all stabilities (Table 3.7-2). Southern winds occur mainly under high-speed neutral and stable (Pasquill stability classes D, E and F) conditions.

TABLE 3.7-1

FREQUENCY OF WINDS BY DIRECTION AND SPEED
APRIL, 1990 — NOVEMBER, 1990

	SPEED CLASS INTERVALS (KNOTS)							
Direction	1, <3 (%)	3, <6 (%)	6, < 10 (%)	10, < 16 (%)	16, <21 (%)	>21 (%)	ALL SPEEDS (%)	MEAN SPEED (knots)
N	4.0	4.3	1.5	0.0	0.0	0.0	9.8	3.8
NNE	2.4	2.3	0.5	0.0	0.0	0.0	5.2	3.5
NE	1.0	0.9	0.1	0.0	0.0	0.0	2.0	3.0
ENE	0.6	0.8	0.1	0.0	0.0	0.0	1.5	3.5
E	0.4	0.9	0.3	0.0	0.0	0.0	1.6	4.2
ESE	0.6	0.9	1.0	0.3	0.0	0.0	2.8	6.0
SE	1.3	2.1	3.2	1.3	0.1	0.0	8.0	6.7
SSE	1.5	2.7	3.8	3.9	0.3	0.0	12.2	8.2
S	1.2	2.0	1.9	2.2	1.0	0.3	8.7	9.3
SSW	0.6	1.7	1.8	1.1	0.3	0.0	5.6	7.6
SW	0.6	1.3	0.8	0.2	0.0	0.0	3.0	5.4
WSW	0.7	1.1	0.6	0.0	0.0	0.0	2.3	4.5
W	0.9	2.0	1.0	0.0	0.0	0.0	3.9	4.6
WNW	1.4	3.2	1.8	0.0	0.0	0.0	6.4	4.7
NW	2.2	4.7	1.6	0.0	0.0	0.0	8.5	4.3
NNW	3.7	7.2	2.7	0.0	0.0	0.0	13.6	4.3
TOTAL	23.2	38.1	22.6	9.2	1.6	0.4	95.0	
AVERAGE								5.6

Calm (less than one knot) = 5.0%
Period mean wind speed = 5.4 knots

TABLE 3.7-2

FREQUENCY OF WINDS BY DIRECTION AND STABILITY

APRIL, 1990 — NOVEMBER, 1990

	PASQUILL STABILITY CLASS						
Direction	A (%)	B (%)	C (%)	D (%)	E (%)	F (%)	TOTAL (%)
N	0.7	0.8	0.9	4.8	1.8	0.8	9.8
NNE	0.4	0.2	0.3	2.5	1.2	0.5	5.2
NE	0.2	0.0	0.1	0.7	0.5	0.5	2.0
ENE	0.1	0.1	0.1	0.5	0.3	0.3	1.5
E	0.1	0.1	0.1	0.6	0.4	0.3	1.6
ESE	0.2	0.1	0.2	1.3	0.7	0.2	2.8
SE	0.2	0.3	0.3	4.1	2.6	0.5	8.0
SSE	0.2	0.2	0.7	7.6	3.1	0.6	12.2
S	0.4	0.5	0.9	5.7	0.7	0.6	8.7
SSW	0.8	0.7	1.1	2.6	0.3	0.3	5.6
SW	0.8	0.5	0.5	0.6	0.2	0.4	3.0
WSW	0.7	0.5	0.1	0.2	0.2	0.6	2.3
W	1.2	0.9	0.1	0.3	0.4	0.9	3.9
WNW	1.3	1.5	0.7	0.6	0.7	1.4	6.4
NW	1.6	2.2	1.0	0.9	1.5	1.4	8.5
NNW	1.6	2.6	2.7	4.1	1.7	1.1	13.6
TOTAL	10.5	11.1	9.8	37.0	16.5	10.4	95.0

The southern wind pattern occurs mostly at night and could be a result of a regional topographic drainage from the higher elevations to the south.

3.7.2 Air Quality

Air quality is defined by the EPA and the State of California in terms of concentration limits for several specific pollutants. These pollutants are PM10, SO_x, hydrogen sulfide (H_2S), nitrogen dioxide (NO_2), CO, oxidants, or O_3, and Pb. California also regulates H_2S, vinyl chloride, and sulfate particle concentrations. Regulated concentration limits for these pollutants are designed to protect public health. Recently, hundreds of toxic and hazardous pollutants have become of concern, but no ambient standards exist for these contaminants.

Sulfur oxides, H_2S and Pb would be emitted by activities related to the Proposed Action, but only in negligible quantities. There would be no vinyl chloride emissions. Ambient concentrations of these pollutants are negligible and will remain so because of the distance of the Project site from industrialized areas.

Ozone exists naturally. Concentration levels of O_3 become elevated in the presence of sunshine and airborne reactive hydrocarbons, which are from urban and industrial sources. Ozone baseline concentrations at the Project site will not be negligible, but will be near natural levels and below State and Federal standards.

The small-sized fraction of particulates are known as PM10 (particles less than 10 micrometers [μm] in aerodynamic diameter). This is the only size fraction that is regulated because the larger sized particulates are not a health concern. Particulate concentrations for the Hayden Hill area are measured at the meteorologic station (Figure 3.7-1). Since this monitoring station is located away from dust sources, such as Highway 139, the observations of PM10 are considered to be representative of baseline for this area. The observed concentrations from June through November 1990, are presented in Table 3.7-3 (Percivalle 1990b). The average PM10 concentration is 12.5 micrograms per cubic meter ($\mu g/m^3$). This is well below the EPA and California annual PM10 standards of 50 $\mu g/m^3$ and 30 $\mu g/m^3$, respectively.

The 27 observations of PM10 particulate concentrations are all relatively low (Table 3.7-3) in comparison to the EPA and California 24-hour standards of 150 $\mu g/m^3$ and 50 $\mu g/m^3$, respectively. The highest concentration measured at the Project site is 37 $\mu g/m^3$, and the second highest is 27 $\mu g/m^3$. These two measurements were taken in August and are probably a result of blowing dust during dry conditions. There appear to be no local sources of dust affecting the baseline particulate concentrations. Other pollutants with concentration limits that would be emitted by the proposed Project are NO_2 and CO.

TABLE 3.7-3

BASELINE PM10 PARTICULATE AT HAYDEN HILL

JUNE, 1990 — NOVEMBER, 1990

Second quarter		Third quarter		Fourth quarter	
Date	PM10 Concen. ($\mu g/m^3$)	Date	PM10 Concen. ($\mu g/m^3$)	Date	PM10 Concen. ($\mu g/m^3$)
6-16	7	7-4	13	10-2	9
6-22	13	7-10	17	10-8	11
6-28	10	7-16	16	10-14	9
		7-22	11	10-20	19
		7-28	15	10-26	7
		8-3	19	11-1	12
		8-9	37	11-7	7
		8-15	27	11-13	11
		8-21	12	11-19	13
		8-27	9	11-25	11
		9-2	17		
		9-7	16		
		9-20	12		
		9-26	11		
Mean	10		16.6		10.9

Period arithmetic mean: 12.5 $\mu g/m^3$

Since the Project area is rural and not influenced by towns and other industrial facilities, the baseline of these pollutants are considered to be less than 10 percent of their standards.

Regarding the toxic and hazardous pollutants, the proposed Project could emit crystalline silica, mercury and hydrogen cyanide. Crystalline silica will likely be present in the particulates at the site because it naturally occurs throughout the western United States. No measurements of silica content have been made, but local geologic data indicates that it could range up to half the dust content. The rock at the Project site is not of a serpentine variety so asbestos concentrations are expected to be negligible. The baseline concentrations of mercury and hydrogen cyanide should be negligible because they do not occur naturally.

3.8 Socioeconomics

Socioeconomic conditions described in this section include: Local economy and employment, population, housing, education, water and sewer services, law enforcement, fire protection, health services, solid waste, local government fiscal conditions, and land use along the power line corridor.

The primary area of influence for socioeconomic effects of the Project would be the City of Susanville and the town of Bieber in Lassen County, and the town of Adin in Modoc County. A secondary area of influence is the City of Alturas in Modoc County. The existing labor pool in the Shasta County communities of Fall River Mills and Burney are also discussed in this analysis; however, these communities are not included in the area of influence because of the relatively high cost of housing.

3.8.1 Employment

Figure 3.8-1 shows employment figures in Lassen and Modoc Counties for the years 1980 through 1989. Employment in Lassen County has increased from the 1980 base total of 9,030 jobs, to 10,000 jobs in 1989. This represents an average annual increase of 1 percent, with 1981 the only year in which total employment declined (-.94 percent). Government is the leading employment sector in the County, and averages 38.84 percent of all employment for the 10-year period. Because the California Correctional Center is the largest civilian employer in the County, the State and local Government sub-sector of government comprises a majority of this 38.4 percent (21.63 percent of the total employment for the period). This sub-sector alone is larger than the next largest employment sector (Services, 16.13 percent). Retail is the third largest employment sector in the County, with an average of 13.42 percent for the period. Although most employment sectors experienced modest average annual increases over the ten-year period, there was significant volatility in specific sectors. The Construction and Manufacturing sectors both had large increases and decreases during the period. The Mining sector was also volatile, although given the small number of mining employees, the net effect on the Lassen County economy was probably minimal.

Employment in Modoc County displayed a modest increase from 4,434 in 1980, to 4,534 in 1989, although declines in total employment were experienced in five of these years. The Agricultural sector is the largest employer in the County with an average of about 24 percent of the employment over the ten-year span. Government is the second largest employer with 22 percent. Of this total, nearly three-fourths (about 16 percent) is State and local government. The third largest employment sector is the Service sector with about 18 percent.

3.8.2 Income

In 1989 dollars, personal income in Lassen County experienced a modest average annual increase of 1.23 percent for the ten-year period. The Agricultural Service sector (including Forestry) exhibited the largest average annual growth rate (20 percent), although there was significant volatility from year to year. The Farming sector experienced an average loss in personal income of about 6 percent.

Personal income in Modoc County experienced an average annual loss of 4 percent over the period. Leading the decline were the Farm and Agricultural Service sectors with average annual losses of 11 and 9 percent, respectively. The Manufacturing sector also suffered an average annual loss of 6 percent. These sectors include workers employed in the timber and forest products industries and reflect the general decline in Modoc County.

3.8.3 Labor Force, Employment, and Unemployment

In Lassen County, the labor force has increased from 8,840 in 1980 to 9,910 in 1989, an increase of 1,070 or 12 percent over the ten-year period. At the same time, employment covered by unemployment insurance increased by 1,447 workers or 18 percent, which lowered the unemployment rate from 13.6 percent in 1980 to 8.3 percent in 1989. Figure 3.8-2 illustrates this period.

In Modoc County, the labor force increased from 3,411 in 1980 to 4,525 in 1982, and fluctuated slightly for the remainder of the period, ending at 4,133, a 12 percent increase above the 1980 level. However, total California Employment Development Department (EDD) covered employment in 1989 was only 11 percent greater than the 1980 level, which resulted in an unemployment rate of 8.2 percent compared to the 1980 level of 7.5 percent. Figure 3.8-3 illustrates this period.

In order to assess the local labor pool for mining employment, statistics provided by the Susanville, Alturas and Burney offices of the EDD concerning workers with appropriate mining skills who were registered for work in July and August of 1990 were used.

The EDD officials interviewed for this analysis believe that, in addition to workers who are registered for work, there exists within commuting distance of the proposed Hayden Hill Project a larger labor pool of individuals with appropriate or transferable skills who would seek work at the Project. These would include workers who are not registered for work, workers who are employed in the timber industry whose current jobs are at risk from recent environmental and legislative actions, and underemployed workers, including those who may have previously held jobs in the timber industry.

3.8.4 Population

Table 3.8-1 displays population for Lassen and Modoc Counties from 1980 to 1989 including estimates for total County population and both municipal and unincorporated areas. Figures 3.8-4 and 3.8-5 illustrate the Lassen and Modoc County populations, respectively. Lassen and Modoc Counties have one incorporated municipality each. In both cases, a more rapid rate of growth occurs in the unincorporated area than within the municipality. In Lassen County, Susanville experienced a net growth of 8 percent from 1980 to 1989 (growing from a population of 6,520 in 1980, to 7,050 in 1989), while the unincorporated area of Lassen County grew about 44 percent, from 15,141 to 21,750. Much of the growth in the unincorporated area occurred immediately outside the Susanville city limits. Lassen County as a whole grew from 21,661 to 28,809, a 33 percent increase in population for the time period. It should be noted that total Lassen County population estimates include the inmates of the California Correctional Center. For example, in 1989 an estimated 3,826 of the total County population were inmates at the Correctional Center (Goldman 1990a).

In Modoc County, the Alturas population increased from 3,025 in 1980 to 3,300 in 1985 (9.1 percent). However, by 1989, the population decreased to 3,020, just below the 1980 level. Meanwhile, the unincorporated area of Modoc County increased fairly steadily from 5,585 in 1980 to 6,355 in 1989 (a net increase of about 14 percent). The net increase in Modoc County total population was 9 percent (from 8,610 in 1980 to 9,375 in 1989).

TABLE 3.8-1

POPULATION: 1980-1989
LASSEN AND MODOC COUNTIES

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Lassen County										
Susanville	6520	6575	6650	6675	6725	6750	6875	6875	6950	7050
Unincorporated	15141	15700	16400	17000	17100	17350	17750	18650	19300	21750
Lassen Total	21661	22250	23050	23650	23850	24100	24650	25550	26250	28809
Modoc County										
Alturas	3025	3060	3170	3200	3300	3260	3200	3120	3020	3020
Unincorporated	5585	5765	5930	6125	6200	6240	6175	6130	6180	6355
Modoc Total	8610	8825	9100	9325	9500	9500	9375	9250	9200	9375
Calif (000,000)	23.668	24.032	24.532	25.052	25.555	26.072	26.694	27.331	27996	28662

Sources: California Department of Finance: Demographic Research Unit, U.S. Census, Planning Information Corporation, March 1990.

3.8.5 Housing

3.8.5.1 Housing Stock

In Susanville, total housing units grew 6 percent or 197 units from 1980 to 1989, according to the California Department of Finance, while the number of vacancies declined fairly steadily. As a result, the vacancy rate in Susanville declined from 7.98 percent in 1980 to 6.28 percent in 1989.

According to the Susanville General Plan, there has been substantial housing construction in unincorporated areas surrounding Susanville from 1980 to 1989 (Napthali H. Knox, et al 1989). However, occupancy has lagged, resulting in higher vacancy rates. The vacancy rate for unincorporated Lassen County, which increased from 21.01 percent in 1980 to 23.78 percent in 1989, reflects use of many units as second and recreational homes (Lassen County Planning Department 1986).

In Modoc County, the number of units has increased from 3,738 in 1980 to 4,590, a total of 852 units or 22 percent. Most of this increase occurred in unincorporated areas, with Alturas growing by only 168 units. The number and rate of vacancies has increased in both Alturas and unincorporated areas. In Alturas, the vacancy rate more than doubled from 6.45 percent in 1980 to 13.40 percent in 1989. The vacancy rate in unincorporated areas increased from 18.72 percent to 23.65 percent over the same period. Modoc County vacancy rates also reflect substantial second home and recreational use (Townsend 1990).

3.8.5.2 Housing Availability

Table 3.8-2 displays the housing available by type for the affected communities. These data were gathered from surveying realtors and rental managers, and from advertised rental listings, and do not reflect housing which may be available by word-of-mouth, or second homes which may become available if demand exists.

At the time of the survey (July 1990), no apartment units were identified in the Big Valley area and only 28 vacancies were noted in Susanville. The Susanville and Alturas rental housing markets were characterized as tight by survey respondents and this is reflected in the table. Adin had four houses and three mobile homes for sale; Alturas had 40 houses and no mobile homes for sale; Bieber had seven houses and three mobile homes for sale; and Susanville had 90 houses and seven mobile homes for sale. There were 67 vacant mobile home pads in Alturas, 60 in California Pines, 21 in Eagle Lake, and 10 in Susanville. A 34-unit mobile home park is planned in Adin. In Susanville, Alturas, Big Valley and Eagle Lake, an average of 13 percent or 75 motel and hotel units were available in the summer, and an average of 55 percent or 318 units were available during the winter months.

TABLE 3.8-2

HOUSING AVAILABILITY: HOUSING UNITS BY TYPE

Proposed Hayden Hill Mining Project

Housing Type	Community	# of Units		Vacancies
Apartments	Adin	0		0
	Alturas	NA		0
	Bieber	0		0
	Susanville	369		28
	Total	369		28
Houses For Rent	Adin			3
	Alturas			NA
	Bieber			0
	Susanville			10
	Total			13
Houses For Sale	Adin			4
	Alturas			40
	Bieber			7
	Susanville			90
	Total			141
Mobile Homes For Sale	Adin			3
	Alturas			0
	Bieber			3
	California Pines			4
	Susanville			7
	Total			17
Mobile Home Pads	Adin	34		34
	Alturas	135		67
	Bieber	NA		NA
	California Pines	160		60
	Susanville	46		21
	Eagle Lake	291		10
	Total	666		192
			Summer	Winter
Motel/Hotel Units	Alturas	210	25	120
	Big Valley	25	4	15
	Susanville	339	46	183
	Total	574	75	318
			Summer	Winter
	Total Vacancies		463	706

Source: Sue Coffelt, Almar Realty; Dawn Miller, ERA Joy Realty; Dan Neer, Dan Neer Realty; Recy Hicks, Hicks Realty; Debra Pauley, Mountain Realty; Hoss Bader, Bader Realty; Planning Information Corporation, July 1990 telephone survey.

3.8.5.3 Land Availability for Residential Development

There is ample land available for residential development in both Lassen and Modoc Counties including approved subdivisions and land zoned for residential development but not subdivided. This includes lands in and near each of the communities in the area of influence as well as in other areas of the Counties (Simon 1990a; Townsend 1990; Lassen County Planning Department 1986; Modoc County Local Agency Formation Commission [LAFCO] 1984). One hundred fourteen acres were zoned for residential use which were vacant in 1989 (Napthali H. Knox, et al 1989). The area surrounding Susanville currently has 80 to 110 vacant residential parcels, with an application pending for an 800-unit single- and multi-family-unit residential project (Simon 1990a). The Bieber area has 21 parcels in a subdivision and several vacant building lots in the town (Simon 1990a; O'Brien 1990). In 1984 there was an estimated potential for 900 lots in the Adin Community Service District boundaries (Modoc County LAFCO 1984). Again in 1984, it was estimated there was a potential for 1,810 residential lots in Alturas (Modoc County LAFCO 1984).

In addition to appropriately zoned land in communities, there are large rural subdivisions in both Counties. The Lassen County Planning Department estimates there are approximately 300 vacant parcels in the Eagle Lake area, although there is a current prohibition on new septic systems (Simon 1990a). Rush Creek Estates north of Adin had about 100 vacant lots in 1984 (Modoc County LAFCO 1984). The California Pines Subdivision includes approximately 15,000 parcels; about 700 of these are currently on the market (California Pines Sales Office 1990).

3.8.6 Education

This section provides information on four school districts which are within the area of influence for the proposed Hayden Hill Project. The districts are: 1) Susanville Elementary School District and 2) Lassen Union High School District in Lassen County; 3) Big Valley Joint Unified School District which spans portions of Modoc and Lassen Counties; and 4) Modoc Joint Unified School District in Modoc County.

3.8.6.1 Revenues

Tables 3.8-3 through 3.8-6 display revenue information for the Susanville, Lassen High School, Big Valley and Modoc Joint Unified Districts, respectively. Please note that tables may not add to 100 percent due to rounding.

Susanville School District

In the 1990-91 school year, Susanville expects to receive a total of about 64 percent of its revenue from all State sources; about 33 percent from all local sources; and about 3 percent from Federal funds (Stone

1990). Please note that the total revenues for Susanville, shown in Table 3.8-3, do not include $4 million in construction money which Susanville will receive from the State Allocation Board.

Lassen Union High School District

In the 1990-91 school year, Lassen expects to receive a total of about 50 percent of its revenue from all State sources; about 48 percent from all local sources; and about 3 percent from Federal funds (Stone 1990).

Big Valley School District

In the 1990-91 school year, Big Valley expects to receive a total of about 48 percent of its revenue from all State sources; about 39 percent from all local sources; and about 13 percent from Federal funds (Tillot 1990).

Modoc Joint Unified School District

In the 1990-91 school year, Modoc expects to receive a total of about 62 percent of its revenue from all State sources; about 34 percent from all local sources; and about 3 percent from Federal funds (Harbaugh 1990) (see Table 3.8-6).

3.8.6.2 Expenditures

Salaries of certificated employees (teachers, principals, and some other chiefly administrative personnel who have the required State certification) make up between 40 and 50 percent of the four districts' expenditures. Salaries of classified employees constitute between 15 and 20 percent. Benefits for both groups total 20 to 25 percent of expenditures. These three categories total together between 75 and 85 percent of all expenditures of the four districts. Books, supplies, minimal capital outlay, services and operating expenses make up the remaining expenditures.

3.8.6.3 Constitutional Limitations

The California constitution requires a two-thirds vote of each house of the California legislature for imposition of a new tax, which may not be imposed if related to the value of property. It also limits the property tax rate on existing property to 1 percent of the value assessed in 1975. This value is fixed until reassessment occurs at the time of sale. Growth in assessed value cannot exceed 2 percent a year. State law also prohibits general obligation bonds which would be funded by property taxes. Finally, all new taxes which are imposed at the local government level must receive two-thirds majority of the popular vote. Property tax funds are subject to little or no local control. The property tax rate is set in the State constitution; the local school board, which collects the tax, has no control over the amount levied. Spending levels are controlled by changes in population and the cost of living. All surplus funds must

TABLE 3.8-3

SUSANVILLE ELEMENTARY SCHOOL DISTRICT
Revenue in Millions of Dollars

	1989-90	1990-91	% of 1990-91 Total
Local Property Tax	$1.128	$1.128	22%
State Apportionment	2.295	2.485	47%
Federal Funds	.195	.185	3%
Other State Funds	.898	.889	17%
Other Local Funds	.392	.560	11%
TOTAL	$4.908	$5.247	100%

TABLE 3.8-4

LASSEN UNION HIGH SCHOOL DISTRICT
Revenue in Millions of Dollars

	1989-90	1990-91	% of 1990-91 Total
Local Property Tax	$1.494	$1.512	29%
State Apportionment	1.814	1.871	36%
Federal Funds	.157	.136	3%
Other State Funds	.706	.715	14%
Other Local Funds	1.178	.987	19%
TOTAL	$5.349	$5.221	100%

Source: Stone 1990.

TABLE 3.8-5

BIG VALLEY SCHOOL DISTRICT
Revenue in Millions of Dollars

	1989-90	1990-91	% of 1990-91 Total
Local Property Tax	$ .735	$ .735	35%
State Apportionment	.661	.668	32%
Federal Funds	.134	.034	2%
State Funds	.334	.334	16%
Other Local Funds	.085	.085	4%
Other Financial Sources	.046	.014	<1%
Forest Reserve Fund	.215	.240	11%
TOTAL	$2.21	$2.110	100%

Source: Tillot 1990.

TABLE 3.8-6

MODOC JOINT UNIFIED SCHOOL DISTRICT
Revenue in Millions of Dollars

	1989-90	1990-91	% of 1990-91 Total
Local Property Tax	$1.364	$1.300	26%
State Apportionment	2.600	2.500	51%
Federal Funds	.460	.186	4%
Other State Funds	.509	.537	11%
Other Local Funds	.278	.333	7%
Deferred Maintenance	.050	.050	1%
TOTAL	$5.261	$4.906	100%

Source: Harbaugh 1990.

be returned to taxpayers within two years of their collection. State-mandated programs must be funded by local governments.

These constitutional provisions have an important effect. Schools are dependent upon State revenue which puts them in competition with all recipients of State revenue, including health and welfare spending, juvenile and adult corrections, and most other State operations. Given the financial strains on California State government, that competition is keen (Wilson 1990).

3.8.6.4 Equalization of School Funding

A formula called revenue limit per average daily attendance (ADA) (limit per ADA) was established by the legislature in 1972. The limit is based on the 1972 property tax plus the 1972 State aid divided by the student population. This limit is the level of funding or State apportionment to which the district is entitled. Each year the legislature sets the amount that the limit per ADA can rise, based on baselines established in 1972, and adjusted for cost-of-living adjustments (COLA). This process is illustrated below.

$$\frac{\text{1972 Property Tax Revenues + 1972 State Aid}}{\text{Student Population (ADA)}} \text{ x COLA = Revenue Limit Per ADA}$$

Apportionment is established for groups of school districts, and for individual districts according to differences among the districts within a group. Adjustment factors considered by the State Department of Education include, for example, declining enrollment and high transportation costs (Wilson 1990).

For 1989-90 Susanville has a limit per ADA of $2,717; for Lassen High School the limit is $3,431; for Big Valley it is $2,969; and for Modoc Unified District it is $3,081 (Stone 1990; Tillot 1990; Harbaugh 1990). Revenue limit per ADA is a cap on certain kinds of revenues: Apportionment from the State, and local property taxes. In simplified terms, if a district's assessed valuation rises and the mill levy is not reduced, State aid is reduced; if the district's valuation declines, State aid increases. However, State aid does not increase to meet every kind of decline in revenues experienced by a local school district.

Federal monies received by school districts are outside the computation for equalization (Wilson 1990). While having the money uncounted (as a revenue in the revenue limit per ADA) allows districts with Federal money to do well when the Federal income is stable or growing, it prevents the State from coming to the district's aid when Federal revenue declines, as it would in Lassen County when logging declines. Receipt by the school districts of the Forest Reserve Funds lags changes in logging by at least a year. Districts therefore have advance notice of declines in revenue. In 1990-91, Susanville anticipates receiving $377,300 and Lassen High School expects $300,000 from the Forest Reserve Fund, both up about $50,000 from 1989-90 (Wilson 1990; Stone 1990; Coryell 1990). These amounts represent 13.5 percent of Susanville's revenues and 8.7 percent of Lassen's revenues.

Other exceptions to the revenue limit per ADA include private grants and categorical funding from the State and Federal governments. Not counted against the revenue limit are funds for driver's education, child care and nutrition, special education, vocational and adult education, capital outlay or textbooks (Wilson 1990; Stone 1990; Coryell 1990). The elements of total district revenues are illustrated below.

+ Revenue Limit Per ADA
+ Legislative Adjustments for Equalization
+ Categorical Funding
+ Private Grants
+ Federal Funds
+ Other Local Revenue

Total District Revenues

3.8.6.5 State Allocations for Capital Construction

The State Allocation Board (SAB) controls the major source of funding for capital projects for schools in California. Each year the SAB issues bonds, backed by the State of California, and uses the capital raised to finance school construction projects throughout the state. In 1990 the SAB has a backlog of about $8 billion in projects and about $800 million from bonds to use to fund those projects.

School districts are given 30-year, interest-free loans from the SAB and the local school district usually is obligated to pay the State one-half of the principal amount borrowed. Districts are authorized to establish a developer fee. This allows a district to collect a fee on building permits issued for residential, commercial and industrial development. If a school district chooses not to enact a developer fee, the district is nonetheless liable for the amount that would have been collected had the developer fee been in place. School districts in Lassen County, and many throughout the state, traditionally have not assessed development fees. Given the current and anticipated level of growth in Lassen County, primarily from the expansion of the California Correctional Center in Susanville, some support exists for enactment of development fees. But local resistance also exists, and the school districts themselves are also divided on the issue.

Repayment of SAB funds is waived under certain circumstances, as it has been in the case of Susanville Elementary School District where the portable buildings used in the past are considered to be the local district's share of the cost of a new elementary school (Stone 1990). The SAB allows a geographic adjustment factor for each county, which is used as a multiplier to inflate construction costs for school buildings, usually because of high labor costs in remote areas.

None of the four districts we discuss here has any bonded indebtedness. Only Susanville plans new construction. Big Valley School District plans to add classrooms and an industrial education facility.

3.8.6.6 School Capacity

Tables 3.8-7 through 3.8-10 present school enrollment data for each district within the area of influence of the proposed Hayden Hill Project.

Susanville Elementary School District
Susanville operates two schools, McKinley Elementary School and Diamond View Middle School. Diamond View is at capacity and McKinley is about 350 students over capacity. Susanville has received approval from the SAB to construct a new elementary school. The new school, Meadow View, is under construction and is expected to be completed by early 1992. The school, which is needed to relieve crowding at McKinley Elementary School, housing grades K through 4, will accommodate 450 students (see Table 3.8-7).

If enrollment increased beyond the 100-student additional capacity to be added with the new school, the district would apply for State money to construct a new building. Because that application would take time and has no guarantee of being funded, the district would have to take more immediate steps. Among the options they would consider are double sessions, year-round classes, and portable buildings. Increases in State funding for additional students would not cover all of the district's costs. To make up the difference, the district could attempt to pass a bond issue or support passage of development fees (Stone 1990).

Lassen Union High School District
The district operates two high schools, Union High School and Credence High School. The population of Credence includes those students who have left the regular system because of disciplinary problems. This separation of school populations, if maintained, could reduce the flexibility of the district in meeting changes in school enrollments. Both schools are now at capacity (see Table 3.8-8).

The system could accommodate additional students in several ways, depending upon the number. If growth is minor, portable buildings could be acquired to house general education classes such as English, mathematics, or social studies. That growth would cause pressure on other facilities like the science laboratories, the gymnasium, library or cafeteria. If growth were of such numbers or duration that

TABLE 3.8-7

SUSANVILLE ELEMENTARY SCHOOL DISTRICT
Enrollment and Capacity

	Grades	Now Enrolled	Capacity	Unused Capacity	Average Class Size
McKinley	K-4	800	450	(350 above capac.)	26.81
Diamond View	5-8	474	474	0	26.81

Source: Stone 1990.

TABLE 3.8-8

LASSEN UNION HIGH SCHOOL DISTRICT
Enrollment and Capacity

	Grades	Now Enrolled	Capacity	Unused Capacity	Average Class Size
Union School	9-12	950	950	0	24
Credence School	9-12	100	100	0	24

Source: Harbaugh 1990.

portable buildings could not be used on a long-term basis, the district would have to construct either a third high school or an entirely new, larger school to house all high school students. The district would not have trouble attracting additional staff. State funds for increased enrollments would not cover all costs of growth. Development fees are being considered as an option to fund growth (Coryell 1990) (see Table 3.8-8).

Big Valley School District
The district has some available capacity, most notably at the high school where enrollment could increase by about 80 percent, or by 74 pupils. The intermediate school could accept a small increase of 12 students or about 10 percent (see Table 3.8-9). The primary school at Adin is at capacity. The district has developed the studies and architectural plans for two classrooms at the elementary school, two classrooms at the middle school, and a new industrial education facility at the high school. The plan will not be put into effect (that is, no buildings will be leased or constructed) unless school enrollment requires it. The district now intends to apply for State school building aid from the SAB. The superintendent believes the district qualifies and will receive the funding (O'Brien 1990). If growth occurred that exceeded the district's capacity, the district could lease portable classrooms until a long-term solution was found. State funding for increased enrollment would not cover all increased costs. Development fees would be considered to supplement State money (Tillot 1990).

Modoc Joint Unified School District
Some excess capacity exists at all Modoc School District schools. It varies from about 10 percent at the high school to 60 percent at the four elementary schools. The middle school has the least capacity for growth in enrollment, about 6 percent (see Table 3.8-10). If the district experienced growth which exceeded its capacity, it would immediately apply to the California Department of Education for portable classrooms which the State leases at a rate of $2,000 per classroom per year. The district would work with the State and with their State legislators to obtain priority on the list of districts seeking portable buildings. If those were not obtainable the district would obtain portable buildings through conventional means at a rate of $10,000 to $15,000 per classroom per year. The district has adequate reserves to pay the immediate costs of additional staff and could, with increased State aid from the larger enrollment, cover increased operations and staffing over the long term. Its resources would be insufficient to fund construction of new buildings (Harbaugh 1990; Lee 1990) (see Table 3.8-10).

3.8.6.7 Average Class Size

The State sets average class size or pupil-teacher ratios only for grades K through 3. In those grades the ratio cannot exceed 30 pupils per teacher on average. In grades 4 through 12 the local school board determines class size (Wilson 1990). Susanville has an average class size of 26.81; Lassen Union High School's classes average 24 to the classroom; Modoc averages 25.35 for grades K through 5, 22 for

TABLE 3.8-9

BIG VALLEY SCHOOL DISTRICT
Enrollment and Capacity

	Grades	Now Enrolled	Capacity	Unused Capacity	Average Class Size
High School	9-12	106	180	74	25
Intermed. School	4-8	138	150	12	28
Primary School	K-3	120	120	0	30

Source: Tillot 1990.

TABLE 3.8-10

MODOC JOINT UNIFIED SCHOOL DISTRICT
Enrollment and Capacity

	Grades	Now Enrolled	Capacity	Unused Capacity	Average Class Size
High School	9-12	245	272	27	18.75
Middle School	6-8	220	235	15	22.00
Alturas Elementary	K-5	500	550	50	25.35
Arlington Elementary	K-5	30	50	20	25.35
Pine Creek Elementary	K-5	30	50	20	25.35
South Fork Elementary	K-5	30	50	20	25.35

Source: Harbaugh 1990.

grades 6 through 8, and 17.75 for grades 9 through 12. Big Valley Schools have an average of 30 pupils per class (Coryell 1990; Lee 1990; Stone 1990).

3.8.7 Water and Sewer Services

3.8.7.1 Water Service

Susanville Water Department

The City of Susanville provided water service to a 1988 population of about 9,400 persons living within an area of approximately three square miles. The service area extends somewhat beyond the boundaries of the City of Susanville (Napthali H. Knox et al 1989).

The sources of Susanville's water supply are Bagwell Springs (located one mile north of the city), Cady Springs (located two miles west of the city), and two wells (Well #1 and Well #3) located southeast of the city. Wells #1 and #3 are only used for five months during the summer to supplement the increased demand (Napthali H. Knox et al 1989). System facilities also include storage tanks (636,200 gallons) and distribution tanks (761,554 gallons total) (Lassen County Planning Department 1982). Susanville's water system has the capacity to serve its residents through 2,900 meters. The system is used at capacity in the summer but not in the winter. The city will probably expand its system next summer with the addition of a new well and storage tank. The additions are expected to increase the system's capacity by 1,000 meters. (The system's capacity in gpm is not available from the city.)

Providing water facilities does not constrain the market from providing housing in Susanville. The cost of providing water averages $420 for a typical subdivision where the subdivider installs the service and approximately $760 for a typical infill lot where the city installs the service (Napthali H. Knox et al 1989).

Consideration to providing efficient supply, needed water facilities improvements, adequate storage, and adequate supply for the future expected population with the Susanville water service area, including the impacts of drought and firefighting demand, as well as to maintaining water quality, has been given in the City of Susanville's general planning process (Napthali H. Knox et al 1989).

Users in the Susanville area outside the water system service area, and not connected to the system, obtain domestic water from private wells (Lassen County Planning Department 1982).

Lassen County Water Works (Bieber Water Service)

Lassen County Water District #1, also known as the Lassen County Water Works, provides water to the community of Bieber, a service area containing about 250 persons. The district, which also provides sewer service to Bieber, employs one full-time manager/maintenance person and one part-time secretary. These employees work on both the water and sewer systems (Jackson 1990).

The Bieber water system consists of two wells operated in a lead-backup configuration. The smaller well (280 gpm) which delivers better water leads during the winter when demand is less. The larger well (425 gpm) leads in the summer when greater volume is needed. Neither well's water requires disinfection. However, all water is chlorinated to control hydrogen sulfide. Bieber water also is treated to prevent precipitation of iron and manganese. Storage is in a 30,000-gallon tower tank which maintains 40 pounds of pressure throughout the system. Water is distributed through about 20,000 feet of line.

The system has capacity for expansion. Taps are available, and, at present, the system can deliver a total of approximately 1 million gallons of water a day, compared to a recorded peak daily demand of 260,000 gallons. Supplying maximum demand requires only 11 hours of pumping from the larger well. There are no imminent water quality or environmental issues facing Bieber's water system. The Bieber water system currently serves 126 residential accounts and 46 business, church, or government accounts. Lassen County Water Works currently carries about $180,000 in debt from a system upgrade in 1980. Debt service of about $12,600 a year is covered by monthly service charge revenues.

The district maintains a policy of requiring developers to construct and pay for main line extensions which are then inspected and assumed by the district. An identified area for future growth within the district is the one-half mile along California Highway 299 from Bieber proper to County Road 422 (or County Road A2). This area is within the district's designated "sphere of influence" (Jackson 1990).

Alturas Water

The Alturas city water and sewer department provides water to the City of Alturas, a service area containing about 3,000 persons. The system serves 1,337 residential taps and 196 commercial taps for a total of 1,533 taps (Adkins 1990). The department includes four employees who work on the water system. Two employees are full time and two are part-time employees: superintendent, foreman, and two laborers of whom one is a meter reader (Modoc County LAFCO 1984).

The Alturas water system consists of four wells located in the central-eastern part of the city. During the winter, the wells are worked in rotation. Additional volume is needed during the summer, and the city plans to construct an additional well at 12th and East "D" streets when funds become available. Maximum capacity of the system is 32,000 gpm (Adkins 1990). The system has 1,200,000 gallons of storage in three water tanks. Although the tanks need repairs for corrosion, work has been delayed for lack of funds. The distribution network consists of lines varying from 4 to 12 inches in diameter. The average domestic or light commercial user has a three-fourths-inch metered service line (Modoc County LAFCO 1984).

Most of the city is covered by the water system. All line extensions are installed at developer expense, with costs ranging between $10 and $20 per foot of line (Adkins 1990). A small, additional area south of the city limits could be covered by an extension of the gravity flow system and without installation of pressure tanks. However, any enlargement of Alturas's water service area is constrained at present by a lack of excess water volume during summer months (Modoc County LAFCO 1984).

Adin Water

The residents of the town of Adin and surrounding development draw domestic water from individual wells. The Comprehensive Area-Wide Water and Sewer Plan for Modoc County (1971) recommended construction of a public water system for Adin, but the Adin Community Services district has been unable to fund the project (Modoc County LAFCO 1984).

3.8.7.2 Sewer Service

Susanville Consolidated Sanitary District

The present sanitary system uses about 40 miles of sewage collector mains which range in age from new to 80 years old. The 9.5-square-mile system has a service population of about 8,500 from the City of Susanville and adjacent areas, including the Lassen Community College, the Susanville Indian Rancheria, the Meadow View School, and two subdivisions, Monte Vista and Copperwood.

The district uses an activated sludge system with extended aeration, secondary chlorination and dewatering of solids. The final effluent is discharged into the Susan River. The system has a design flow of 1.2 million gallons a day (mgd) and an average daily flow of 0.731 mgd. It was installed in 1975 and updated in 1984 and 1988. Under the direction of the general manager, three plant operators are employed by the district as well as two additional persons who do secretarial and bookkeeping work.

The district has about $2.2 million in debt, the vast majority of which was incurred to fund construction of sludge-handling facilities. The present indebtedness will be paid in the year 2006 with revenues from sewer charges. The district's annual operating expenses, including debt service, is $726,347.

The district could accommodate an additional 1,876 living units. When 75 percent of the system capacity is reached (anticipated to be mid-1992), the district plans to begin its next phase of construction. Very few lots have service taps installed but developable land exists with good access to mains. All new construction is funded by the developer and then granted to the district (Strahan 1990).

Lassen County Water Works (Bieber Sewer Service)

The Bieber sewer system is owned and operated by Lassen County Water District #1. As noted above, the combined water-sewer system has two employees, a full-time manager/maintenance person and a part-time secretary. The service area is the community of Bieber, containing about 250 persons. The service area currently is being expanded to include commercial and industrial establishments (including Big Valley Lumber) at the junction of California Highway 299 and County Road 422 (County Road A2) with the extension of a main sewer line. The one-half mile stretch between Bieber proper and the intersection was previously identified as a growth area and included within the district's designated sphere of influence.

The sewer system consists of two anaerobic digestion ponds covering about five acres and two evaporation ponds covering about ten acres. The zero-discharge system currently serves 132 residential and 37 business and other accounts. The system has a design capacity of about 250 residential units but suffers from seasonal infiltration problems. Infiltration problems currently are being addressed. Additional acreage was purchased a few years ago, and improvements are scheduled which will modify the ponds to use the available acreage better. Once scheduled improvements are complete, the system should have the capacity to accommodate one-third as many customers or more as it has at present, depending on the type of use. With active management, the system can be operated in compliance within the zero-discharge requirement.

The sewer system currently carries about $50,000 in debt from a system upgrade in 1972. Debt service of about $4,000 a year is covered by taxes assessed on property within the district.

Alturas Sewer

The city water and sewer department includes two full-time sewage treatment plant operators and two other employees who work on both the water and sewer (Adkins 1990). Alturas's sewage treatment plant is located at the confluence of the North and South Forks of the Pit River, less than one-quarter mile south of town. This is the site of the original 1936 facility (Modoc County LAFCO 1984). The collection system consists of about 20 miles of gravity-flow collection pipes, with four lift stations before treatment (Adkins 1990).

The treatment plant has a design flow of approximately 500,000 gallons of effluent per day. The system uses a trickling filter, primary and secondary clarifiers, and chlorination before release into the Pit River (Adkins 1990). Infiltration problems are apparent during wet weather; there is a decrease in flows during the summer (Modoc County LAFCO 1984). The capacity of the system and the effect of infiltration is in question, at the present, and the accuracy of the flow meter was verified in October 1990. Records indicate the system is at or near capacity. The system's consulting engineer estimates that it is operating at about 90 to 95 percent of capacity (Adkins 1991), and so could accommodate a small amount of growth. In 1990, there were 1,345 domestic and 196 commercial hookups (Adkins 1990). The city water and sewer department maintains the main lines within Daphnedale (Modoc County LAFCO 1984).

Adin Community Services District (Adin Sewer Service)

Sewage collection and treatment for the town of Adin and some surrounding land is provided by the Adin Community Services district. The district includes about 420 acres, a little more than 17 acres of which are located in Lassen County, with the remainder in Modoc County. The sewage system service area is mostly contained within the district boundaries, and serves 143 taps (Modoc County LAFCO 1984). In 1990, the service area population is estimated at about 375 persons (Armstrong 1990).

The treatment facility consists of two primary and two secondary facultative ponds, three evaporative ponds (for a total of eight acres of evaporation and two acres of percolation), two lift stations, and 1.5 miles of collector mains. The installation of aerators would double the evaporation capacity of the system. No discharge is allowed from the system (Armstrong 1990).

Sewage treatment ponds for Adin are southeast of, but not contiguous to, the community services district. There is an expanse of undeveloped and unsubdivided land between the district boundary and the district sewage treatment ponds. The ponds and the intervening land are not in the district's sphere of influence (Modoc County LAFCO 1984).

The ponds were constructed with a design capacity of about 23,000 gallons of effluent per day. In 1984, the then 128+ hookups produced approximately 12,000 gallons of effluent per day when infiltration was minimal (an average of about 94 gallons per day [gpd] per hookup). However, the system experiences severe infiltration problems caused by a variety of defects and broken main lines. These problems have contributed to readings in the past of 50,000 or more gallons of effluent per day (Modoc County LAFCO 1984).

Today the system's design flow is 30,000 gallons per day and the average daily flow is 12,000 gallons per day (Campbell 1990). One part-time employee operates and maintains the system at an annual average operating cost of $49,500. The system has a debt of $130,000 with an approximate annual debt service cost of $11,000 from system revenues. The debt will be retired in 2012 (Armstrong 1990).

About 350 parcels exist within the boundaries of the Adin Community Services District, and the majority of them are zoned residential. About ten undeveloped lots have unused taps available. The board does not have any plans for expansion of or investments in the system in the near future (Armstrong 1990). The chronic infiltration problems severely limit the district's ability to provide additional service. However, if infiltration is halted, the existing ponds can handle some additional population, assuming no change in the current average of 94 gallons of effluent per hookup per day. There is adequate land within the district to accommodate significant growth (Modoc County LAFCO 1984).

3.8.8 Law Enforcement

3.8.8.1 Lassen County Sheriff's Department

The Lassen County Sheriff's Department divides its forces among five areas; 1) suburban Susanville and nearby communities; 2) Herlong-Doyle area; 3) Westwood area; 4) Eagle Lake area; and 5) Big Valley area. The department assigns 1 of its 26 sworn officers to Eagle Lake and 2 to Big Valley. These officers are resident officers, effectively on call 24 hours a day, with backup forces from the department for vacation and sick days. Thirteen non-sworn correctional officers are employed at the County jail.

The force covers 4,500 square miles with 12 patrol vehicles assigned to resident posts rather than to specific officers. Officers are dispatched through the County's dispatch center which handles all 911 calls in the County. Police and emergency response calls are directly dispatched; fire calls are transferred to the interagency fire dispatch center. Susanville funds 40 percent of the costs of the dispatch center and the County funds the rest.

The sheriff stated emphatically that the current level of staffing is inadequate and that the budget for next year allows for only 12 deputies, a reduction of 5. He says that the size of the area covered and the number of residents present serious difficulties to serving the existing population. He expects that with population growth or the budgeted reduction of staff, or both, his ability to provide for the public safety would be seriously compromised. He is unsure of the effect on law enforcement that Hayden Hill may have because he has not received details of Hayden Hill's security arrangements. He notes that the current coverage of the Nubieber and Bieber areas is inadequate and that any growth would only exacerbate that situation.

Under the direction of the sheriff and the commander, the jail is operated by 13 detention-correctional officers. The County jail is inadequate and the sheriff is under a Federal court order to reduce the number of prisoners or to increase the number of cells. The jail has 41 beds including 16 in a temporary facility. The new jail was completed in the summer of 1991 with facilities for 248 prisoners. Half of the occupancy of the jail will be rented to the State for housing minimum-security parole violators. The remaining half will be used by the County and the City of Susanville (Jarrel 1990).

3.8.8.2 Susanville Police Department

Personnel consists of 14 sworn officers, including the chief, a clerk, and an animal control officer. Six patrol cars, one motorcycle and one parking meter vehicle make up the agency's motor pool. Officers are dispatched from the central dispatch jointly provided by the City and County. According to the chief of police, the department is understaffed. He cited a grand jury report which suggested the hiring of an additional six or seven officers. The grand jury also recommended expansion of the dispatching center. Susanville Police Department uses the Lassen County jail for detention of its prisoners (Murphy 1990).

3.8.8.3 Modoc County Sheriff's Department

In addition to the sheriff, Modoc County employs 8 sworn deputies, 1 deputy for civil cases and 9 members of the jail staff to total 18. Each deputy is assigned a patrol car. One resident deputy is assigned to the Big Valley area at Adin. This deputy is backed up by the rest of the department, 40 miles away, during vacation and sick days. The sheriff's office operates the 911 center for the County and employs enough dispatchers to staff the telephone lines with two dispatchers at all times.

Modoc County jail has 14 cells which, due to double-bunking, can house 28 prisoners. An expansion is under construction and is expected to be completed by early 1992. The expansion will allow the jail to accommodate 38 prisoners without double-bunking.

The sheriff does not believe that the current level of staffing is adequate. In fact, he says, they have about half the staff needed and the budget proposes to cut two positions from present levels. The jail's inadequacies are being corrected by the expansion described above. The sheriff believes that the resident deputy at Adin could accommodate some population growth because the level of calls is sporadic, with busy times interspersed with times without much activity (Mix 1990a).

3.8.8.4 Alturas Police Department

The Alturas Police Department is composed of the police chief, seven additional sworn officers and one secretary. One of the deputies is dedicated to investigation of illegal use of drugs. The chief is assigned one patrol car and the other six officers share three patrol cars. Officers are dispatched by the department during the day; at night, between 4 p.m. and 7 a.m., the sheriff's dispatch center takes over. The chief believes that the department is staffed adequately for today's public safety needs, in spite of the fact that the department's caseload has tripled since 1987.

The police department uses the Modoc County jail to house its prisoners. Until now the city has not paid the County for this service. The County is proposing a booking fee which could cost the city $50,000 annually (Picket 1990).

3.8.9 Fire Protection

Fire protection is managed by a variety of Federal, State, special district and municipal organizations in Lassen and Modoc Counties. Each community in the area of influence of the proposed Project has a local fire protection district or department and volunteer fire squad (and sometimes paid staff) to protect structures from fire. This section discusses the coordination of firefighting, the resources of local fire departments and districts as well as the resources of State and Federal agencies operating in the area.

3.8.9.1 Coordination of Fire Protection Response

Coordinated response and mutual assistance is a priority in fire protection in order to supply the highest level of public safety possible at the least cost. In Modoc County the sheriff's office receives all 911 calls and they are passed on to the appropriate agency for dispatch (Caldwell 1990). Individual fire districts also have telephone numbers used to report fires directly to the district. The Susanville Interagency Fire Control Dispatch Center provides a coordinated response to fire calls in Lassen County which allows the agency with equipment and firefighters located closest to the fire to respond to the call. The response of firefighters and equipment of the California Department of Forestry and Fire Protection (CDFFP), BLM, fire protection districts, the Lassen National Forest, the Sheldon National Wildlife Refuge, and Lassen Volcanic National Park are coordinated by the center. Lassen County has 14 active fire protection districts which, along with the State and Federal agencies, come to each other's aid. That aid includes: firefighters, aerial reconnaissance, fire jumpers, hot-shot crews, tankers, pumpers, emergency generation and communication systems, in short, everything needed to fight a fire effectively.

The districts have formal and informal agreements to provide fire protection assistance to each other (Bouse 1990b). Each district maintains at least one fire station and a volunteer fire department. The fire rating for most of these districts ranges from 7 to 10. (A rating of 1 denotes the best possible fire protection service; a rating of 10 results when distances to water supplies are great, where departments are staffed by volunteers, or when equipment is less than optimal.)

3.8.9.2 Adin Fire Protection District

The district is adequately staffed by 35 volunteer firefighters who meet once weekly for training and equipment maintenance. The volunteers could serve twice as many structures as they do at present. The fire rating for the district's service area is 8.

Property taxes account for nearly 75 percent of the district's $24,000 budget. The district has no debt and has accrued $40,000 toward the $150,000 it needs to purchase a new pumper. The district's three pumpers and two tanker trucks, though old, are well maintained. The district maintains three buildings which would be adequate for its present service level but would probably require supplementing with additional equipment and space if population growth occurred (Criss 1990).

3.8.9.3 Alturas Fire Department

The Alturas fire department serves the incorporated limits of Alturas, about two square miles. It has a fire rating of 4 and is staffed by 1 full-time fire marshall and 36 volunteer firefighters. They respond in an average of three minutes to an average of 60 calls per year consisting of fire calls, emergency calls, severe accidents, and hazardous materials spills. The marshall considers the number of volunteers to be adequate but would like an additional paid staff member. The department's budget for 1990-91 is about $140,000. The department's equipment would be adequate for as many as 1,000 persons or 500 new homes, but could not satisfactorily serve commercial buildings over three stories high. If additional equipment were purchased the present fire hall would have to be expanded or replaced (Watters 1990).

3.8.9.4 Alturas Rural Fire Protection District

The staff and equipment are considered more than adequate by the chief, who believes that the district could handle about twice as many residents with no increase in facilities, equipment or volunteers. The district's budget for 1990-91 is about $30,000 (Jacques 1990a).

3.8.9.5 Big Valley Fire Protection District

The district serves the area from Nubieber to the Modoc-Lassen County line. The district's 12 volunteers are adequate for present fire calls, but the chief would prefer to have more volunteers. The district divides its equipment into primary and secondary equipment, depending upon its age and condition. The chief says that the district's equipment is sufficient to serve a population twice the present population in the district, as long as the mutual aid agreements with the CDFFP continue in force. However, he is concerned about the age of the equipment, especially if growth in population led to an increase in the number of fire calls. He believes that the equipment might fail if it were used twice as often as it is now. Funding for new equipment could come from the reinstatement of the mill levy for the district. The 1990-91 budget for the district is $42,000 (Gerrig 1990).

3.8.9.6 Eagle Lake Fire Protection District

At present, the Eagle Lake Fire Protection District and Stones Bengard Community Service District are operated as one, by both the joint fire chief and the dispatchers. The chief would like more volunteers than the present 15, but sees no prospects for additional members unless population in the district increases. The chief notes that seldom are all 15 able to respond to a fire and on some occasions as few as five volunteers have responded to a call. If population increased the district would need to recruit more members.

The equipment is adequate for present needs but, because of the age of the vehicles, would probably wear out quickly under more intense use. Growth that involved multi-story buildings, or buildings on steep or rough terrain could not be accommodated by the district with its present equipment. If the population in the district grew to a great degree, the chief believes the volunteer fire district should be replaced with a paid staff. The joint district's budget in 1990-91 is about $42,000, an amount raised almost exclusively through the imposition of a parcel assessment fee (McCormick 1990).

3.8.9.7 Canby Fire Protection District

Eighteen volunteer firefighters form the staff of a district with population of about 500. The staff and equipment is adequate to serve the present population and about 1,000 more. They respond on average to only three fires a year. The district's budget is about $24,000 and they have about $120,000 accrued in an account for replacement equipment (Carter 1990; Sherer 1990).

3.8.9.8 Susan River Fire Protection District

The district has three fire stations; one in Johnstonville, one at Leavitt Lake, and one on Richmond Road. The engines are considered by the chief to be inadequate because of their age. Two other fire districts are called automatically to back up the Susan River Fire Protection District when it receives a call to control a structural fire. The district is undergoing re-rating by a fire-rating bureau and the chief expects the bureau to recommend the purchase of newer equipment. Modern equipment would allow the district to accommodate an unspecified amount of growth. The upgraded equipment could be paid out of a development fee the district is considering imposing. The district's budget for 1990-91 is about $75,000 (Martin 1990).

3.8.9.9 Susanville Fire Department

The department is staffed by 7 paid employees and 20 volunteer firefighters who responded to 131 fire calls, 262 emergency calls and 143 other calls, for a total of 536 calls in 1988. The chief believes the current level of staffing is inadequate and the fire-rating bureau, which will be re-evaluating the department in 1990, will recommend additional full-time staff. The current level of staffing is the same as it was 15 years ago, when the department's service area had about one-third less land area. The additional land that was annexed is not yet fully developed. If it is developed with structures the department would have difficulty serving all of its service territory.

If growth occurs the department would hope to obtain additional funding from development fees. The department expects to receive an impact fee of between $40,000 and $50,000 from the new Wal-Mart store and sees this as the first step toward the acquisition of a new $350,000 pumper with an aerial ladder. Although the department is meeting the community's needs now, it expects that the fire-rating bureau will suggest the purchase of additional equipment. The department's budget for 1990-91 is expected to be about $300,000 (Rose 1990).

3.8.9.10 Other Fire Protection Districts

Lassen County has ten additional agencies providing fire protection with volunteers and equipment at Clear Creek, California Correctional Center at Susanville, Doyle, Janesville, Lake Forest, Little Valley, Madeline, Herlong, Standish-Litchfield, and Westwood. These districts and the Correctional Center are either too geographically remote from Hayden Hill to respond to a fire there, or have insufficient equipment to fight a fire at Hayden Hill and maintain suppression ability in their own districts. Therefore, these agencies would be unlikely to respond to a fire at Hayden Hill, but do provide backup support to each other, depending upon location and equipment needs (Rose 1990; Sherman 1990).

3.8.9.11 State and Federal Fire Protection

Fire protection for those areas outside each fire protection district, on land managed by the BLM, the CDFFP, or the USFS, is coordinated by CDFFP according to a Memorandum of Understanding (MOU) which describes each agencies' area of responsibility, not necessarily based on ownership of the land. That MOU is undergoing revision now to realign service areas. In general, the BLM and USFS are responsible for controlling wildland fires on land under their jurisdiction; CDFFP is responsible for fire protection in areas classified as range, watershed, or timberlands on a year-round basis; and local fire districts are responsible for the fire protection of land under cultivation which has no range, watershed or timber value (Keefer 1990). The resources of the BLM, CDFFP, and USFS are discussed below.

3.8.9.12 California Department of Forestry and Fire Protection

CDFFP responds to structure and wild-land fires outside its ordinary areas of responsibility during the summer when fire danger is high. Where districts overlap or jurisdiction is unclear, CDFFP responds primarily to wildfires, and the local fire district responds primarily to structural fires. CDFFP provides fire protection to lands under the jurisdiction of the BLM, unless the BLM's equipment is closer to the fire or the CDFFP has requested the BLM to respond. CDFFP monitors temperature, humidity, wind and weather forecasts constantly to determine the level of initial response to a fire call.

The CDFFP has a fire station equipped with two engines and a bulldozer located near California Highway 36 about one-quarter mile west of Susanville. Its stations at Bieber, and at Grasshopper just north of Eagle Lake, are considered by CDFFP to be key stations which get backup equipment from other areas during seasons of intense fire calls. The CDFFP has a large resource to call upon in the event of large wildland fires. In the district, which includes all of Modoc and Lassen Counties and a small part of Plumas County, CDFFP has an annual budget of about $5.5 million, 12 fully staffed engines, 2 bulldozers and about 100 permanent employees. These permanent employees are supplemented by about 100 seasonal employees and 15 to 17 crews of inmates from State facilities at Bieber, Alturas and Susanville who are called upon as needed.

By agreement, the CDFFP stations at Bieber and Grasshopper would respond to fires at the Hayden Hill site, even though some of the land is under the jurisdiction of the BLM and USFS. The USFS station at Adin would probably also respond to a fire at Hayden Hill. The CDFFP station at Bieber has two engines, one bulldozer and a helicopter which are staffed and ready 24 hours a day during fire season and 8 hours a day during the winter. The helicopter hauls water to fires as well as transporting victims when other ambulance service is not on the scene. The helicopter could reach Hayden Hill in six to ten minutes (Sherman 1990). The station at Grasshopper has two engines. The ranger unit chief for the district estimates, during summer peak-staffing time, that CDFFP engines and crews could arrive at Hayden Hill within 20 to 25 minutes from Bieber and within 30 minutes from Grasshopper. Both the engines and helicopters would take significantly longer in winter when staffing levels are down, and firefighting teams would have to drive to the stations from their homes.

The ranger unit chief for CDFFP considers the present staffing and equipment levels to be adequate, in large part because he has the ability to call upon firefighters and equipment in other areas during periods of intense demand. He sees resource problems only during lightning season, the period when most wildland fires occur, when they may have as many as 15 or 20 lightning fires burning at a time. His present level of staff and equipment could handle population growth without increases because CDFFP's principal responsibilities do not include structures and because, as population centers emerge and grow, fire protection districts are formed to protect them (Keefer 1990).

3.8.9.13 Bureau of Land Management

The BLM station which could be called upon to assist CDFFP with a fire at Hayden Hill is the station at Dry Creek, between Likely and Madeline on California Highway 395. The station is staffed with 2 permanent employees and 15 seasonal workers who operate the station's two engines. The BLM is considering moving the Dry Creek fire station closer to Likely. A second station at Ravendale, with its two engines and helicopter, could also be called upon. According to the area manager, the BLM's staff, facilities and equipment are adequate for their needs today and in the future. Like CDFFP, the BLM would not be affected by population growth, because its responsibilities are mainly to land rather than structures (Roush 1990).

3.8.9.14 U.S. Forest Service

The USFS acts to help other firefighting agencies when needed and can, in turn, call upon those agencies for help (Bouse 1990b). The USFS can also call upon USFS resources from other areas in California and in Oregon, as well as nationwide.

The USFS has 40 to 45 firefighters in the Modoc County area, operating 8 engines from 8 far-flung fire stations. The stations are: 1) Buck Creek, near New Pine Creek; 2) Alturas; 3) Canby; 4) Adin; 5) Crowder Flat north of Alturas; 6) Dry Lake north of Canby; 7) Tulelake; and 8) Long Bell north of Lookout. They have no aircraft for carrying water or victims. Its current level of staffing, facilities and equipment are adequate for the present. Population growth could induce additional human-caused fires which could cause a shortage of resources for the USFS. Human-caused fires account for about 20 fires a year in the Modoc area of the USFS-jurisdictional land. A proposed power line coming south from Oregon will result in the addition of an engine to protect the line from fires (Cavasso 1990).

In the Lassen National Forest Eagle Lake Ranger District, the USFS has two lookout stations. The district has about 50 employees who fight fires, including the 20-person, hot-shot crew at Bogart. Equipment for fighting fires is available from logging and construction companies as well as from other USFS districts. The USFS dispatcher for the area does not consider either the staffing or equipment to be adequate for current needs and believes the USFS could not accommodate any growth without increased staff and equipment. The money necessary to fund increases would be appropriated by the U.S. Congress. The district has requested an additional engine and seven more workers to replace cuts in equipment and staff that took place in 1989 (Addy 1990).

3.8.10 Health Services

3.8.10.1 Big Valley Medical Center

The center provides outpatient care for about 3,000 patients who make about 8,000 visits to the center each year. It is licensed as a nonprofit community clinic and handles most physical emergencies which do not require overnight or intensive care, as well as drug screening and company physical examinations. The center's staff of one physician, one registered nurse, one nurse's aide and one family-nurse practitioner is adequate at present, but could not accommodate any growth. The center has too few examination rooms for its current needs and is planning to expand by building a new facility on land donated by a private corporation. When the center is expanded it will offer dental care in addition to its other services. Its budget was $379,000 for 1990, funded about 75 percent from patient fees, charged on a sliding scale according to ability to pay, and the remainder from State funds. Sixty percent of its patient fees are paid through mediCal and medicare. The new facility would be constructed from tax-free private donations and grants (Jones 1990).

3.8.10.2 Carewest-Warner Mountain Nursing Center

This facility in Alturas has 59 beds, used chiefly as a nursing home for elderly patients. It was recently purchased by the County and will be operated in conjunction with the Modoc Medical Center.

3.8.10.3 Lassen Community Hospital

The hospital in Susanville serves a 50-mile radius of Susanville and has 28 acute-care beds and 31 skilled-nursing beds housed in separate buildings. The emergency room is open and staffed by a physician 24 hours a day through a contract arrangement. Thirteen physicians are on staff. Lassen Community is a full-service hospital whose services include; routine medicine and surgery, emergency room, obstetrics, gynecology, pediatrics, radiology, blood bank, EKG, inpatient physical therapy, respiratory care, social services, outpatient treatment, general surgery, and clinical laboratory.

The hospital had 1,396 admissions to the acute-care facility in 1989 and an occupancy rate of 43.5 percent in the acute-care facility and 80.9 percent in the skilled care building in the same year. The administrator believes both are adequate for the present, and the former could accommodate a doubling of occupancy and the latter a 10 to 15 percent increase with no additional beds or rooms required. The increase in occupancy rate, however, would strain the ancillary services like the laboratory and X-ray units. Maintenance and administrative sections could absorb some increase.

The cost of upgrading facilities could be paid from a proposed dwelling unit fee. The owner and operator of the hospital, St. Mary's Health Care Corporation, is divesting itself of the hospital, and the dwelling unit fee is seen as the solution to the shortfall between expenses and patient fees. The hospital's master plan lists $2 million in improvements over the next five years, if funds permit. The current year's budget is $8 million. Ambulance service in the community is offered by a private company (Weston 1990).

3.8.10.4 Modoc Medical Center

The medical center in Alturas has a total of 87 beds, 16 of which are acute-care beds. The center offers; obstetrics and gynecology, respiratory therapy, physical therapy, orthopedics, general surgery, laboratory and X-ray, and air ambulance service.

New cardiac monitors and X-ray equipment are on order. A total of 464 patients were admitted in 1989. The community has 11 physicians who attend patients at the hospital. The hospital has a budget of $4.5

million. The hospital facilities and medical staff could accommodate additional patients, with the exception of the nursing staff. The hospital operates an ambulance service for emergencies and uses an air ambulance to transfer patients to other facilities (Morris 1990; Jacques 1990b).

3.8.10.5 Northeastern Rural Health Center

The center serves all of Modoc and Lassen Counties and parts of Plumas and Shasta Counties. It directs three community health care facilities in Susanville, Doyle and Westwood. These facilities offer complete outpatient primary health care including obstetrics, psycho-social care, and hospice care, as well as a number of health education programs. The center also operates an office in Alturas which provides health education, family planning and vouchers for food through the supplemental nutrition program for women, infants and children. About 35 percent of its patients are medicare or mediCal patients. The center had 36,000 medical visits in 1989.

The centers can accommodate no growth, according to the director who is considering moving administrative offices in Susanville to new space in order to expand the center's health care functions there. Its equipment is not really adequate for the number of visits it now receives. The center's budget for 1990 is $2 million (Harder 1990).

3.8.11 Solid Waste Disposal

3.8.11.1 Lassen County

Lassen County owns (or leases) and operates all sites in the County used for the disposal of solid waste. Solid waste in Susanville is collected throughout the city and trucked to a landfill at Bass Hill. Five other landfill sites in the County are located at Ravendale, Bieber, Madeline, Westwood, and Herlong. One transfer station is operated at Little Valley, Wendel, and two stations are at Eagle Lake. These stations provide receptacles for waste until the waste can be transferred to a landfill by a company under contract with the County. Assuming a 3 percent growth in solid waste, the landfill at Ravendale has a 5-year expected life and the landfill at Bieber has a 10- or 15-year expected life. The solid waste system in the County is considered adequate overall (Millar 1990).

Fees for using the landfills cover most operational expenses, but do not cover costs for acquiring land. Neither do they cover the costs of closing a landfill site nor any post-closure costs. Closure and post-closure costs include various State-mandated measures to prevent environmental degradation and involve 15 years' monitoring and controlling water run-off. The County, therefore, is not meeting all State standards for landfill sites (Millar 1990).

3.8.11.2 Modoc County

Like Lassen County, Modoc County operates all landfills in the County. The County operates five landfills, one near Alturas and four in Surprise Valley. Transfer stations are located in Adin, Lookout, Newell, Davis Ranch, Likely, Canby and Cedarville. The site used by Alturas, which has the shortest span of any of the five sites, is projected to be closed in 2010 with current usage and no growth in population. When that site is closed, Alturas will probably be served by a transfer station (Wickenden 1990).

The department believes about one-third of the estimated $350,000 total cost of operating the landfills will be generated from the fees. All remaining expenses will be funded from the County general fund. The County is setting aside $40,000 a year to be used to cover landfill closure costs (Brooks 1990).

3.8.12 Local Government Fiscal Conditions

The governments considered here are Lassen County and the City of Susanville, and Modoc County and the City of Alturas. California Counties are responsible for providing a variety of services to County residents, including those in cities as well as those in unincorporated areas. Counties also provide some municipal-type services for residents of unincorporated areas.

The need to fund higher levels of service for County jails, for numerous programs emanating from the State health and welfare agency, and for indigent legal defense and other programs has expropriated funds formerly available to maintain or improve levels of service in libraries, cultural programs, youth activities, and even services which affect public health and safety, and public works. Raising property tax rates requires approval in a general election. Counties and municipalities have access to a 1 percent general sales and use tax. In Lassen and Modoc Counties, as in many California general law Counties, most sales and use tax proceeds inure to the municipalities which are the Counties' principal trading centers, namely Susanville and Alturas.

Local revenues provide the largest measure of support for Susanville and Alturas. The local sales and use tax is the largest source of general revenue, with property taxes providing significant additional revenues.

3.8.12.1 Lassen County

Tables 3.8-11 and 3.8-12 present summaries of operating expenditures and operating revenues for Lassen County government for three fiscal years. Amounts are actual for fiscal year 1987-88 and budgeted for fiscal years 1988-89 and 1989-90. Operating expenditures and revenues on a per capita basis for 1989-90

TABLE 3.8-11

OPERATING EXPENDITURES SUMMARY
Lassen County

	Actual 1987-88	Budget 1988-89	Budget 1989-90	% of Total 1989-90
General Government	$ 2,246,602	$ 2,224,491	$ 2,600,440	11%
Public Protection	3,841,016	4,212,908	4,908,762	21
Health & Sanitation	1,299,453	1,722,450	2,631,601	11
Public Assistance	6,961,945	8,155,107	9,425,751	40
Roads & Facilities	3,781,493	5,087,238	3,932,467	16
Education	241,827	230,965	251,027	1
Recreation	56,929	84,525	100,816	-
Equipment	166,309	0	0	-
TOTAL	$18,595,574	$21,717,684	$23,850,864	100%

TABLE 3.8-12

OPERATING REVENUES SUMMARY
Lassen County

	Actual 1987-88	Budget 1988-89	Budget 1989-90	% of Total 1989-90
Property Taxes	$ 2,629,399	$ 2,805,599	$ 3,158,380	14%
Sales & Use Taxes	368,516	556,476	584,300	3
Intergovernmental Revenue	12,275,522	13,833,213	14,664,530	67
Other	2,616,449	3,570,466	3,533,160	16
TOTAL	$17,889,886	$20,765,754	$21,940,370	100%

Source: County of Lassen.

are $828 in expenditures and $762 in revenues, respectively, using a 1989 population of 28,809. Please note that table totals may not add to 100 percent due to rounding.

Lassen County has had an increasing operating deficit over the three fiscal years. Deficit amounts were $705,688 in 1987-88, $951,930 in 1988-89 and $1,910,494 in 1989-90. During budget deliberations in 1990, it was evident that requested operating expenditure levels needed to continue past levels of service will exceed operating revenues. Efforts to balance the budget have focused on reducing discretionary services in order to allow for funding of State-mandated services.

Currently Lassen County is facing a budget crunch which may require reductions in force across a number of County functions, including sheriff's patrols, and the possible withdrawal of all funding from the County library system.

3.8.12.2 Susanville

Tables 3.8-13 and 3.8-14 present summaries of operating expenditures and operating revenues for the City of Susanville for two fiscal years. Amounts are budgeted amounts for both 1988-89 and 1989-90. Operating expenditures and revenues on a per capita basis using a 1989 population of 7,050 are $373 and $368, respectively.

Susanville has run a small budget surplus for both budget years, if salaries and expenses associated with operating the housing rehabilitation program are excluded (surpluses of $128,223 in 1988-89 and $53,992 in 1989-90). Including the community development program expenses, the City of Susanville posted an operating surplus of $38,923 in 1988-89 and an operating deficit of $35,308 in 1989-90.

3.8.12.3 Modoc County

Tables 3.8-15 and 3.8-16 present summaries of operating expenditures and operating revenues for Modoc County government for three fiscal years. Amounts are actual for fiscal year 1987-88, estimated actual for fiscal year 1988-89, and budgeted for 1989-90. Operating expenditures and revenues on a per capita basis for 1989-90 using a 1989 population of 9,375 are $1,644 and $1,547, respectively.

Modoc County ran an operating budget surplus in 1987-88 but has run a gradually increasing operating deficit since then. The surplus recorded in 1987-88 was $94,803, and deficits of $908,006 and $911,579 were recorded in 1988-89 and 1989-90, respectively.

TABLE 3.8-13

OPERATING EXPENDITURES SUMMARY
City of Susanville

	Actual 1988-89	Budget 1989-90	% of Total 1989-90
General Fund	$1,778,091	$2,116,943	83%
Street/Gas Tax Funds	469,143	302,759	12
Public Transit Fund	20,000	21,000	1
Airport Fund	50,930	32,993	1
Swimming Pool Fund	59,746	66,913	3
SUBTOTAL	2,377,910	2,540,608	100%
Community Development Fund	89,300	89,300	
TOTAL	$2,467,210	$2,629,908	

TABLE 3.8-14

OPERATING REVENUES SUMMARY
City of Susanville

	Actual 1988-89	Budget 1989-90	% of Total 1989-90
Property Taxes	$ 392,000	$ 394,000	15%
Sales and Other Taxes	1,325,000	1,472,750	56
Licenses & Permits	40,700	46,200	2
Intergovernmental Revenues	508,833	454,800	18
Charges for Service	151,200	144,200	6
Fines and Forfeits	42,000	34,200	1
Miscellaneous Revenues	46,400	48,450	2
TOTAL	$2,506,133	$2,594,600	100%

Source: City of Susanville.

TABLE 3.8-15

OPERATING EXPENDITURES SUMMARY
Modoc County

	Actual 1987-88	Estimated 1988-89	Budget 1989-90	% of Total 1989-90
General Government	$ 1,879,046	$ 2,381,177	$ 2,806,208	18%
Public Protection	2,038,310	2,202,905	2,445,293	16
Health & Sanitation	655,234	844,117	996,490	6
Public Assistance	3,122,805	3,694,846	4,609,374	31
Roads & Facilities	2,860,399	2,864,322	4,059,553	26
Education	190,660	110,388	333,301	2
Recreation	110,500	128,919	166,902	1
TOTAL	$10,856,954	$12,226,674	$15,417,121	100%

TABLE 3.8-16

OPERATING REVENUES SUMMARY
Modoc County

	Actual 1987-88	Estimated 1988-89	Budget 1989-90	% of Total 1989-90
Property Taxes	$ 1,932,290	$ 2,147,315	$ 2,074,283	14%
Sales & Use Taxes	141,000	151,901	150,000	1
Intergovernmental Revenue	7,277,163	7,704,317	10,640,236	74
Other	1,601,304	1,315,135	1,641,023	11
TOTAL	$10,951,757	$11,318,668	$14,505,542	100%

Source: Modoc County Budget.

3.8.12.4 Alturas

Tables 3.8-17 and 3.8-18 present summaries of operating expenditures and operating revenues for the City of Alturas for two fiscal years. Amounts are actual for fiscal year 1988-90 and budgeted for fiscal years 1989-90. Operating expenditures and revenues on a per capita basis using a population of 3,020 for 1989 are $403 and $435, respectively.

Alturas ran a deficit of $88,357 in 1988-89. However, significant cutbacks in expenditures in water, sewer, and public works departments returned an operating surplus of $95,852 in 1989-90.

3.8.13 Potential For Development Along the Electric Transmission Line

3.8.13.1 Study Area

Hayden Hill Mine would receive electric service from Surprise Valley Electrification Corporation (SVEC), a rural cooperative utility which serves the Adin area. The 69 KV transmission line would run from Adin south along California Highway 139 to Hayden Hill, using the highway right-of-way (ROW) for most of the distance. The point at which the proposed transmission line crosses territory presently unserved by electric lines is the point at which the potential for induced growth occurs. No distribution lines, owned by any utility, serve the area south of County Road A2, to the south for 20 miles south of Hayden Hill. County Road A2, then, is the northern-most point at which the study area begins and it continues south a mile on either side of the corridor of the proposed transmission line to the Project site at Hayden Hill. SVEC has adequate power available to serve additional customer load, with a reserve capacity of at least 20 percent. SVEC has a contract with Bonneville Power Administration (BPA) to provide SVEC with all of its power requirements. The transmission line to serve the Project will be lightly loaded, that is, it is designed to carry additional load if necessary (Hayes 1991).

3.8.13.2 Zoning Constraints

Lassen County has passed several ordinances to govern the creation of subdivisions. In November of 1988, the Lassen County Board of Supervisors adopted a policy for development on private land in areas of the County where fire protection for structures is not provided. Resolution No. 88-117 provides that areas zoned A-1 which lack structural fire protection cannot be divided for residential uses in parcels below 40 acres in size. Under the Lassen County General Plan, A-1 zoning is intended for agricultural uses and a minimum parcel size of 20 acres is usually considered appropriate for those uses. An exception permits a single subdivided parcel if more than one family dwelling had been approved for occupancy before the adoption of the resolution. Land in areas zoned UC-2 (upland conservation) cannot be subdivided in parcels smaller than 80 acres with or without structural fire protection. Exceptions to

TABLE 3.8-17

OPERATING EXPENDITURES SUMMARY
City of Alturas

	Actual 1988-89	Budget 1989-90	% of Total 1989-90
General Government	$ 171,733	$ 167,070	14%
Planning Department	1,214	1,309	-
Police Department	339,329	326,055	27
Street Department	212,153	220,215	18
Public Works	30,187	14,829	1
Recreation	57,323	64,023	5
Water	244,014	215,285	18
Sewer	165,878	107,372	9
Fire Department	75,101	75,656	6
Animal Control	30,081	24,899	2
TOTAL	$1,327,013	$1,216,713	100%

Source: City of Alturas.

TABLE 3.8-18

OPERATING REVENUES SUMMARY
City of Alturas

	Actual 1988-89	Budget 1989-90	% of Total 1989-90
Property Taxes	$ 190,465	$ 197,448	15%
Sales & Other Taxes	392,736	408,425	31
Licenses & Permits	39,864	43,640	3
Intergovernmental	159,207	162,006	12
Charges	423,620	471,446	36
Fines & Forfeits	1,088	1,492	-
Misc Revenues	31,676	28,108	2
TOTAL	$1,238,656	$1,312,565	100%

Source: City of Alturas.

Resolution No. 88-117 can be made by the board of supervisors if they believe it is in the public good, but no exceptions have been made to date (Anderson 1990; Simon 1990b).

There are currently six parcels zoned A-1 and 211 parcels zoned UC-2 that lie within a one-mile radius of the power line corridor. Based on current zoning constraints, 182 units could be developed on those parcels.

3.8.13.3 Surprise Valley Electrification Corporation Extension Policies

The extension policy of the electric cooperative acts to encourage service to new customers, and to encourage electric use by those customers (SVEC 1988). As a public utility, SVEC is obligated to serve those within its service territory who request service. The cost of serving the customer may be included in the rates for the customer if service requires significant capital investment (Allen 1990). The area south of County Road A2 to Eagle Lake has not been certificated to SVEC, or to any utility to date, therefore no utility presently has the obligation to serve. The construction and operation of the transmission line by SVEC could create an obligation to serve the area for SVEC by effectively extending SVEC's territory (Hayes 1990).

3.9 Land Use

3.9.1 Introduction

The land use section was prepared in consultation with the BLM, USFS, CDFG, California Department of Transportation (Caltrans), Lassen County Assessor's Office, and Lassen County Planning and Public Works Departments.

This section describes the existing land uses and ownership at the Hayden Hill Project. Mixed land ownership and land uses occur within and around the proposed Project site boundary.

The Project area encompasses lands which serve multiple purposes for numerous land owners and a variety of land users. Land ownership within the Project area is currently held by Federal, State, County, and private entities. Figure 1.5-3 shows the land ownership. A distinction is made between the Project area and the land use mine site block. The Project area refers to the area within which all proposed activities will occur; it includes all the lands affected by ore excavation, stockpiling, processing, administration, the two well field corridors, and Hayden Hill Road. The "land use mine site block" refers to the Project impact area exclusive of the well field corridors, the eastern portion of the access road, and the power transmission line corridor as depicted in Figure 3.9-1. Land ownership within the 1659-acre land use mine site block includes:

- 950 acres of private land;
- 512 acres of BLM-administered land; and
- 197 acres of USFS-administered land.

Access into the proposed Project area is provided by several roads cooperatively maintained by the County, USFS, and the BLM. (Please refer to Section 3.12, Transportation)

The area in the vicinity of the site boundary supports a variety of land uses which include open range, wildlife habitat, timber production, recreation, and mineral exploration. The following sections describe the primary land uses in the area.

3.9.1.1 Range

The USFS and BLM range conservationists determine the proper stocking rate and distribution of animals in pastures by allotment in Allotment Management Plans. Annual and seasonal fluctuations in forage production require that the USFS, BLM and permittees work together to optimize the use of the range resources.

Range livestock operations occupy all vegetation types in the study area. Open range areas in Preston Canyon and the Indian Springs drainage also provide livestock grazing. Lassen County has an "open range" ordinance. This allows Federal permittees to graze livestock on Federal lands and adjacent private lands, if they are unfenced.

USFS Range Program

The USFS has designated two grazing allotments in the Project vicinity (Figure 3.9-2). The East Bieber and Willow Creek Cattle and Horse allotments fall within the Project site boundary. Each grazing allotment is subdivided into pastures. The USFS issues grazing permits on 10-year terms and in assignments referred to as animal unit months (AUMs). One animal unit month is the amount of forage required by one cow and one 6-month old calf, or their equivalent, for one month (SCS 1976). This is equivalent to approximately 1,000 pounds of air-dried feed.

The Bunselmeier Spring well field corridor is in the southeast portion of the East Bieber allotment. The entire East Bieber allotment (40,000 acres) provides 3,753 AUMs to approximately six permittees between May 15 and September 30, under both USFS term and term private land grazing permits.

The land use mine site block, access road, and the Preston Canyon well field corridor fall within the Willow Creek Cattle and Horse Allotment. The Willow Creek Cattle & Horse Allotment consists of 9,410 acres of USFS open range land and 1,528 acres of open range private lands administered by the

USFS. The Willow Creek Cattle & Horse Allotment provides 803 AUMs to one permittee between May and November 15, in a two pasture deferred system.

The USFS indicates there are a total of 129 head of livestock on a USFS term grazing permit and another 66 head of livestock on a term private grazing permit. Within the land use mine site block is an existing stock pond located in Section 25 and approximately 5 miles of fencing along the western boundary of the allotment. The stock pond shows heavy use by livestock.

BLM Range Program

The BLM also issues grazing permits to livestock operators in a program similar to that used by the USFS. The Daisy Dean Allotment consists of 686 acres of BLM land within an approximately 3,000 acre allotment boundary, as shown on Figure 3.9-3. The BLM lands are within the land use mine site block. Mr. Haskell Parks and Mr. Jerry Parks (a father son family business), utilize 77 AUMs for 17 cows in a two pasture deferred system between May 16 and September 30. The USFS Willow Creek Allotment and the BLM Daisy Dean Allotment jointly comprise the two pasture deferred system. However, the lack of fencing between BLM and private properties in the area currently provides additional open range and forage to the Parks livestock which is permitted by the 77 AUM assignments.

Another BLM grazing allotment, the Butte Creek Allotment, is located along the east side of Highway 139 in the proposed power line corridor (Figure 3.9-3). The Butte Creek Allotment consists of 600 acres located in Section 15, T38N, R9E.

3.9.1.2 Agricultural Preserve

The Williamson Act or California Land Conservation Act of 1965 establishes agricultural preserves. Under the Act, cities or Counties can identify areas to be designated for agricultural uses, recreational uses, open space, and "compatible uses". Lands designated as agricultural preserve are assessed at a lower tax rate and are established by resolution of the governing body following a public hearing. Williamson Act lands account for approximately 658 acres of agricultural preserve within the land use mine site block in Section 1, T36N, R9E. (Figure 3.9-4).

3.9.1.3 Timber

The USFS Big Valley Ranger District is in the process of analyzing the proposed Letterbox timber sale located in portions of: Sections 3, 10-15, 22, 27, 34, and 35 T37N, R9E; Sections 33 and 34 T38N, R9E; and Sections 18, 19 and 30 T37N, R10E. To date, the USFS has not identified any old growth timber on USFS lands within the Project area. A candidate mature forest stand has been identified near Letterbox Hill. Limited commercial forest lands do occur within the proposed access and utility corridors.

The BLM has identified approximately 88 acres of commercial forest land in Section 36, T37N, R9E. The BLM classifies 77 acres as Jeffrey pine commercial forest land and 11 acres as "problem regeneration" Jeffrey pine pole and sapling-size commercial forest land. Commercial forest lands are defined by the BLM to be lands which produce greater than 20 cubic feet per acre per year of timber. Section 36 also supports 27 acres of land designated as non-commercial forest land which includes scattered large Jeffrey pine.

3.9.1.4 Recreation

No recreational facilities currently exist in the proposed Project area. One facility, the Willow Creek Rest Stop and Campground, is located 1-1/2 miles east of the Project access road on Highway 139. The USFS maintains this facility. The BLM and other agencies do not maintain any public recreation facilities in the area. Under current conditions, no improvements or establishment of recreational facilities are anticipated. Refer to Section 3.13 on Recreation for additional information.

Hunters are the primary recreational users of the area. A California State game refuge (45,000+ acres) was established between 1917 and 1923 to protect sage grouse and antelope populations. Since its establishment, public hunting has been prohibited within the game refuge except where the Fish and Game Commission has specifically authorized such "taking" of wildlife.

Two privately authorized wildlife management areas are located outside of the Project area and within the State game refuge: the Silva Flat Private Lands Wildlife Management Area (PLWMA) and the Dillon Lake PLWMA. The owners of these private properties have entered into an agreement with the California Fish and Game Commission whereby hunting of waterfowl is permitted in exchange for approved habitat work performed on the properties. The Silva Flat PLWMA is 80 acres in the S 1/2, SE 1/4, Section 10, T36N, R9E and includes the northernmost portion of Silva Reservoir. The Dillon Lake PLWMA is 200 acres in the N 1/2, SE 1/4, Section 13, T36N, R9E. The wildlife management goal for both areas is to increase waterfowl nesting habitat for geese and ducks. Both private wildlife management areas are owned jointly by D/S Wildlife Preserve, Inc. and Mr. Larry Newhall.

3.9.1.5 Prime Farmland

There are no prime or unique farmlands within the Project area as designated by the SCS, the office of Coastal Zone Management, or the National Oceanic and Atmospheric Administration.

3.9.2 Land Ownership

3.9.2.1 Federal Lands

Federal lands within the Project site are administered by the BLM and the USFS. Approximately 197 acres within the land use mine site block are administered by the USFS and 512 acres are administered by the BLM. The mining of minerals on open Federal lands is authorized by the General Mining Law of 1872. Therefore, the mining of gold is not considered a discretionary action by the USFS or the BLM. The Federal Land Policy and Management Act (FLPMA) of 1976 through the CFR, defines specific procedures and environmental standards that mining operations must comply with to prevent "unnecessary or undue degradation" of Federal lands (43 CFR 3809, Surface Management). Where other statutory authority specifies a distinct level of environmental protection or reclamation, that level of protection must be met.

3.9.2.2 BLM Alturas Resource Area Management Plan

The BLM's current Alturas Resource Management Plan was approved in 1983. The Plan identifies management objectives for the 10 management areas within the 407,300-acre Alturas Resource Area. The Management Plan reviews each Management Area for its resource values, opportunities, issues, and concerns. The Plan was developed to meet the requirements of FLPMA and satisfy BLM planning policies for wilderness review, a court mandate that requires the BLM to complete a livestock grazing EIS, off-road vehicle use, and potential land disposal or exchange to increase overall agency efficiency and effectiveness.

The Project site boundary falls within the west half of Management Area 10 - Mountain Management Area (MA-10, Figure 3.9-5). Planning objectives, opportunities, issues and concerns, as identified for BLM lands within the Project boundary in the Land Management Plan, follow:

Range:	The Management Area has been identified as having potential for improved range forage condition. The Silva Flat Allotment has been identified as an allotment for which a new Allotment Management Plan (AMP) may be developed. (The AMP was developed in 1983).
Fish and Wildlife:	Management Area 10 contains notable habitat for deer, antelope, raptors, and sage grouse. Natural grassland, springs, and reservoirs throughout MA-10 provide important habitat components for all species.

Timber and Woodland:	Commercial and non-commercial forest lands occur in the Management Area.
Cultural Resources:	Potential National Register sites occur within the Management Area. A Cultural Resource Management Plan has been prepared for areas within the site boundary. Refer to Section 3.10 on Cultural Resources.
Minerals:	The Hayden Hill Mining District occupies approximately 2,400 acres within the Planning Area. The Management Plan identifies the area as having the highest potential for mineral exploration. Future mining is compatible with the Management Plan.
Wilderness:	No wilderness opportunities have been identified by the BLM within the site boundary.
Threatened and Endangered Plants:	No Threatened or Endangered species have been identified within the Project site boundary.

3.9.2.3 USFS South Adin Management Area

The Modoc National Forest is divided into four districts, each managed by a district ranger. The USFS lands which fall within the site boundary are managed by the Big Valley Ranger District. Each district is subdivided into Management Areas and grazing allotments. The Project falls within the South Adin Management Area. Figure 3.9-2 shows the three grazing allotments located within the South Adin Management Area. The allotments are; East Bieber, West Bieber, Oxendine, Willow Creek, and Spring Hill.

The South Adin Management Area consists of 90,226 acres of National Forest land. Modoc National Forest Draft Land Management Plan (1987b) is a 10-year plan developed and used by the USFS in conjunction with public participation to identify the public resources and to guide management efforts.

In the vicinity of the Project area, cattle grazing and wildlife habitat are important uses of the South Adin Management Area. The Hayden Hill Mining District occurs in the southern portion of the Management Area and the USFS recognizes in its Land Management Plan the ongoing exploration and anticipated future operation of gold mining.

Management direction in the South Adin Management Area is to:

- Suppress wildfires within specified parameters;
- Correct stream bank erosion in Willow Creek;
- Revise and update existing allotment plans;
- Restore degraded riparian areas in the Willow Creek and East Bieber Allotments;
- Provide old growth in eastside pine;
- Utilize snag management techniques to increase snag densities;
- Plan and implement habitat improvements for the introduction of Modoc suckers into Willow Creek; and
- Protect active goshawk nest territories, necessary to meet population targets.

The CDFFP manages and maintains a fire tower located on the top of Hayden Hill. The fire tower occupies 5,000 square feet.

3.9.3 State Jurisdictional Lands

Highway 139 was deeded to the Lassen-Modoc Joint Highway District prior to its transfer to Caltrans in the 1930s. Currently, the State ROW at the intersection of Highway 139 and Hayden Hill Road is 132 feet (total width). North of the intersection along Highway 139 to Adin, the State Highway ROW varies between 100 and 200 feet total width.

The CDFG is not a landowner, but regulates hunting within the State game refuge, located southwest of the mine site.

3.9.4 County Jurisdictional Lands

Lassen County has regulatory authority over private lands not administered by State and Federal entities. The County does not have jurisdiction over the use of Federal lands, however it is the designated Lead Agency responsible for permitting uses on private properties under the California Environmental Quality Act (CEQA) and implementing the California Surface Mining and Reclamation Act (SMARA) of 1975 as conditions of the County use permit. SMARA applies to mining operations on land within the State of California. Approximately 950 acres of private lands occur within the land use mine site block.

Lassen County also administers the ROW for Hayden Hill Road (County Road 534). The ROW appears to be a prescriptive right established by historic use.

3.9.4.1 County General Plan

The Lassen County General Plan (1968) consists of the General Plan map, a set of policies, and a set of standards for land development. The intent of the Plan is to identify public goals in a document which will serve as the basis for future land use within the County. The Plan provides direction for future growth and recommends development goals for the County.

The General Plan identifies the following development goals:

1. Protect the use of the County's wildlife, natural beauty and wilderness character;

2. Improve and diversify the industrial base;

3. Increase and improve public and private services and facilities for both residents and visitors; and

4. Improve and diversify livestock and other agricultural industries.

The County General Plan recognizes three primary natural resources in the Project area. The natural resources include; General Forest environment, Grazing and Sagebrush environment, Scenic Highway corridor and Prime Recreation area. Figure 3.9-6 shows the various "environments" identified in the Project vicinity by the General Plan. The General Forest environment includes the areas believed to be best suited to timber production and watershed. Areas identified as Grazing and Sagebrush environment have been used for livestock grazing and are typified by open spaces and a lack of tree canopy.

Areas identified in the General Plan as having recreational potential occur in the General Forest and Grazing and Sagebrush environments. Both environments have values which may attract recreationists while providing other compatible uses.

Prime Recreation areas determine where recreational facilities exist and where recreational development should occur. The General Forest, Grazing and Sagebrush environments are suited to recreational uses. The Hayden Hill area is identified in the General Plan as a potential site for tourism development as a "ghost town".

Areas shown as Scenic Highway on Figure 3.9-6 include roadways, their ROWs and the scenic areas visible from the roadways. The designation does not preclude changes to the order, but is intended to guide development which will maintain the character of the natural surroundings.

3.9.4.2 County Zoning District Classifications

Lassen County further classifies lands into zoning districts. Chapter 18.102 of the Lassen County Zoning Ordinance identifies the General Provisions and Exceptions which apply to all zoning districts. All zoning districts except "O-S", "O-D", and "O-H", or as otherwise specifically prohibited, allow surface mining and the removal of minerals, earth, or construction materials if a Conditional Use Permit has been approved. In addition, the General Provisions allow, in all districts without a use permit, "public utility, electric, gas, water, oil, and telephone transmission and distribution lines," provided that maps, showing the proposed routes together with a written description of the structure heights and ROW widths, are submitted to the Planning Commission, and the routes are mutually acceptable to the Planning Commission and the utility agencies. Zoning district classifications in the Project area are shown in Figure 3.9-7 and are summarized below:

- "U-C" Upland Conservation District - This district classification is assigned to "mountain and upland foothill areas of [Lassen] County in which forestry, mining, grazing and noncommercial recreation are natural and desirable uses; in which protection of the watershed lands from [wildfire], erosion, pollution and other detrimental effects is essential to the general welfare and in which land divisions will be regulated to ensure compatibility with primary uses." (Chapter 18.102, Lassen County Zoning Ordinance.) Lands suited to agricultural preserve are included in this district. Processing of minerals is allowed in this district with a Conditional Use Permit.

- "U-C-2" Upland Conservation/Resource Management - This district classification is similar to "U-C" district classification. Lands classified by the General Plan as "Natural Resources" and identified as General Forest Environment, grazing and sagebrush environment, Cropland and Prime Grazing Land, Scenic Highway Corridors, and Prime Recreation Areas are included in the "U-C-2" district classification. Mining or processing of minerals is allowed in this district with a Conditional Use Permit. All Federal lands within the County are designated "U-C-2"; however, the actual management of these lands defers to the administering Federal agency.

- "T-P-Z" Timber Production Zone District - This district classification is assigned to areas which are "dedicated to the growing, conserving, and production of timber" and in areas "of sufficient size to be economically feasible." (Chapter 18.102, Lassen County Zoning Ordinance.) Mining is permitted by right in T-P-Z districts provided it will not convert 3 acres or more of the land to non-timberland uses.

- **"A-P" Agricultural Preserve Combining District** - This district classification is applied in combination with other districts to define districts where portions of the land have been reserved by contract with the County under the California Land Conservation Act of 1965 (The Williamson Act). Land uses on or proposed for agricultural preserves must be compatible with the use of the preserve as determined by the County administering the preserve to retain the official agricultural preserve benefits.

3.9.4.3 Caltrans Right-of-Way

Caltrans administers the ROW along Highway 139 and Highway 299.

3.10 Cultural Resources

3.10.1 Introduction

A Class I and a Class III cultural resource inventory of the Project area was conducted by Western Cultural Resource Management, Inc. (WCRM), during April and May 1989, and May 1990 (Lennon et al 1990; Peterson 1991). The cultural resource study areas are shown on Figures 3.10-1 and 3.10-2.

3.10.2 Results of Inventory

The cultural resource study involved a Class III study of the Project area our parcels) and an access/corridor route inventory (in four parcels). It also involved a Class I file search of the fire lookout replacement site. All prehistoric and historic cultural sites found are discussed below. No paleontologic resources were discovered.

3.10.2.1 Mine Block Inventory

The cultural study area, Figure 3.10-1, encompasses all sites and facilities that could possibly impact cultural resources associated with the extraction and processing of ore. After completion of the inventory, all but six sites (two historic and four prehistoric) were eliminated from the Project area. Subsequently, all of these sites were evaluated for National Register significance by the BLM and the State Historic Preservation Office (SHPO). The historic sites were determined to be eligible to the National Register of Historic Places (NRHP) and a data recovery plan (mitigation plan) has been developed in consultation with SHPO.

Upon completion, this plan will be submitted to the Advisory Council on Historic Preservation (ACHP) for review and comment. All four prehistoric sites were determined to be not eligible to the NRHP, and no further work is necessary.

3.10.2.2 Access/Corridor Routes Inventory

Additional access and corridor studies were conducted after the main survey was completed. Access and corridor routes include Bunselmeier Springs, Preston Canyon, along Hayden Hill Road, and the transmission line along Highway 139 (Figures 3.10-1 and 3.10-2). The additional survey for these four access/corridor ROWs totalled approximately 21 miles (334 acres). Twenty-eight cultural resource sites were identified; 13 prehistoric and 15 historic. Two additional prehistoric sites were identified by Caltrans in 1990. It has been determined that Project realignment has avoided all of these sites. No further work is necessary for these sites, unless impacted by subsequent Project redesign.

3.10.2.3 Snag Hill Site for Hayden Hill Fire Tower Replacement

The Project will require the removal of the existing Hayden Hill fire tower. A new lookout will be built on Snag Hill, located nine miles east of Hayden Hill, to replace the fire tower. During the Class I archeological file search, it was found that the USFS did a previous survey of the Snag Hill site in 1977 (USFS 1977). No significant cultural sites were found.

3.10.3 Prehistoric Resources

3.10.3.1 Mine Block Inventory

A total of 4 prehistoric sites/components are located within the mine block inventory boundaries. The prehistoric sites are small lithic scatters which are surface manifestations with little potential for subsurface in-situ cultural deposits. Subsurface probes placed in two of the prehistoric sites show that subsurface artifacts are found in secondary depositional contexts due to the effects of solifluction, mud flows, and sheet wash.

Two lithic scatters were chosen for subsurface testing for buried cultural material, based on their geomorphological context. The testing program was designed both to establish the presence or absence of buried cultural deposits and to determine whether or not the deposits were in a primary or secondary depositional context based on the site geomorphology. Subsurface cultural material was located on both sites. The results of the probing show, however, that the site depositional context is secondary. All four sites have been determined not eligible for inclusion on the National Register and no further work needs to be done on them.

3.10.3.2 Access/Corridor Routes Inventory

A total of 13 prehistoric sites/components are located within the access/corridor route inventory boundaries. The prehistoric sites are small lithic scatters which are surface manifestations with little potential for subsurface in-situ cultural deposits. All of the prehistoric manifestations are considered lithic scatters as described previously with the exception of one prehistoric component which only contained two projectile points.

3.10.4 Historic Resources.

3.10.4.1 Mine Block Inventory

The historic sites are related to late 19th and early 20th Century mining, historic and modern ranching, and 20th Century natural resource conservation. Subsurface probes in the Hayden Hill Townsite indicate the site has subsurface archaeological potential.

A total of 8 historic sites were identified during the inventory. An additional 5 sites were identified which contain both historic and prehistoric artifacts. Two of the historic sites had been previously identified; the Hayden Hill Townsite and the Hayden Hill fire tower. USFS archaeological surveying report ARS 05-09-575 entitled "Hayden Hill Fire Lookout Relocation" was reviewed for this EIR/EIS (USFS 1990a). The Hayden Hill fire tower is a property under the ownership of the CDFFP. Further recording was conducted at these two sites. For the Hayden Hill Townsite, the recording included test probes to evaluate the potential for subsurface cultural material.

The Hayden Hill Townsite consisted of; two boarding houses, a central residential area, two cabins (one with a water system), several foundations or building remains, a powder or ice house, a livery stable and residence/office, the town jail, three mines (Juniper, Evening Star, and Golden Eagle), several ore houses and/or tipples, a smelting furnace, and a mine frame.

The other historic sites include a homestead, a mine site and two mining related dumps, two trash scatters, one seasonal cowboy camp, a cabin, a timber loadout, and a windmill.

The Hayden Hill Cemetery, which is within the boundary of the townsite, is a small cemetery consisting of about 14 plots. No grave markers exist other than stone piles and a few wooden markers, some of which are simple crosses. There is one memorial plaque dated 1954, set in a concrete block. The entire boundary of the cemetery is fenced. Unmarked grave sites may exist within the Project area.

3.10.4.2 Access/Corridor Routes Inventory

A total of 15 historic sites/components were recorded. The historic sites are related to late 19th and early 20th century mining, and historic and modern ranching. The historic sites include a previously recorded arrastra flume, a mill site, four mine sites or sites with mine related materials, a cabin site, three sites with ranching related material and structure, a historic power line, three historic trash scatters, and a hunting camp.

3.10.5 Native American Resources

A review of the pertinent Native American source materials including Roybal and Evans (1982, Sites with Cultural Significance for the Up River Bands of the Pit River Tribe) and Theodoratus (1979, Anthropological Overview of a Portion of Lassen and Modoc Counties) listed Hayden Hill a possible power site for the Pit River Indians. No other resources were noted.

3.11 Visual Resources

3.11.1 Methodology

3.11.1.1 Hayden Hill Project Area

Visual resources for the Hayden Hill Project were evaluated using the POO by Hayden Hill Operating Company, United States Geographical Survey (USGS) topographic maps for the site and surrounding area, the Modoc National Forest Map, aerial photography, USFS handbooks, and conversations with USFS and BLM staff.

Portions of the Project area involve Federal land managed by the BLM and USFS and private holdings. The Project area and surrounding areas, which are in the National Forest, were rated for Visual Quality Objectives (VQOs) by the USFS using USFS criteria. These objectives set specific criteria that management activities must meet in order to maintain an identified landscape quality. The BLM has not prepared landscape descriptions for the area at this time. Through conversations with the USFS, the BLM, and Lassen County it was agreed that the Project would be evaluated using the USFS Visual Management System.

The viewshed from State Highway 139 has been designated as a primary area of influence through the Project scoping evaluation, and includes the Willow Creek Campground and rest area. The viewshed from Lassen Volcanic National Park has been identified as a secondary area of influence.

3.11.1.2 Hayden Hill Power Line

In order to provide electric power to the Project facilities a new 69 KV transmission line is proposed to run south from Adin approximately 17 miles to Hayden Hill Road. The proposed transmission line would extend from the substation located north of town along an existing power line ROW. South of Adin, the transmission line would be located in the existing Caltrans ROW along the east side of State Highway 139 until it reaches Hayden Hill Road approximately 13 miles to the south. From that point the transmission line would leave the Highway 139 ROW and travel in a southwesterly direction up Hayden Hill Road and to the mine site.

The line would be constructed using wood pole structures which would be approximately 55 feet in height, and the average span would vary from 250 to 450 feet between poles. The ROW for the line would be 20 feet in width, and south of Adin, would remain completely within the Highway 139 ROW which averages 100 feet in width for most of the distance.

The USFS Visual Management System was used to determine the VQOs for the Highway 139 corridor. In order to perform the analysis, USGS and aerial photography were used, a site visit was conducted, the traveling experience was videotaped from a passenger car for the 15 mile corridor, and numerous conversations were conducted with a variety of local, County, State and private individuals. Information on the transmission line was supplied by SVEC and Power Engineers, Inc. The existing landscape character and sensitivity of potential viewers to the area were identified. After the VQOs were identified and mapped, the Visual Absorption Capability (VAC) of the power line corridor was determined based on the USFS Visual Management System. Finally, impacts were identified and a number of measures were indicated to mitigate adverse visual impacts.

3.11.2 Landscape Description

3.11.2.1 Hayden Hill Project

The general landscape characteristics of the Project area are described in Section 3.1.1 of this document. Generally, the low and relatively flat hills are typical of this part of the Pacific Mountain System. There is little visual variety in vegetation patterns, landform and color in the landscape, although there is more variety in color in the fall months.

Much of the site has been previously disturbed. Mining activity in the late 1800s and mining exploration in the 1980s have visually impacted the Project area. In addition, livestock grazing activities, minor development of natural springs, and minor logging activities are evident in the landscape surrounding Hayden Hill.

State Highway 139 is located northeast of the Project and is a travel route to Reno for tourists from Washington, Oregon, and British Columbia. The top of Hayden Hill is approximately 1.7 miles from Highway 139 at its closest point (see Figure 3.11-1). Other roads around the site are dirt or gravel roads that are used for administrative use by Federal and local agencies, and access for hunters. The Project well field corridors, Preston Canyon and Bunselmeier Spring, are situated along these routes.

3.11.2.2 Hayden Hill Power Line

While the landscape along the Highway 139 corridor is typical of the topography found in the Pacific Mountain area of northeastern California, there are variations as one moves north from Hayden Hill Road to the town of Adin. In general, the landscape in this physiographic region is characterized by low to moderately diverse landforms, rolling hills, broad valleys, and few dominant features. There are few exposed rock outcrops and ridges are generally vegetated. Vegetation is moderately diverse, typical of a semi-arid climate. The pattern varies from continuous pine and Juniper forests on hillsides to sparse shrub, sage and grasses on flat plains.

The Highway 139 corridor was divided into five segments according to distinct changes in the landscape. These segments are shown on Figure 3.11-2. Section I is an enclosed valley with sparsely vegetated slopes and road cuts on the east side. The west side of the highway contains relatively diverse vegetation with aspen and willows near Willow Creek giving way to a pine forest on the steeper hillside.

Section II is an open valley. On the west side of Highway 139, the views consist of cultivated hay fields with pine forest on the gentle hills behind. Looking to the south along a 0.7 mile stretch of the highway, the top of Hayden Hill is visible between two adjacent hills. Views to the east are to sparse vegetation consisting of scrub, sage and grasslands with mixed Juniper and pine on gently rolling hills behind.

Section III is an alternating open and enclosed valley. To the west, the open valley contains views of pasture land with hillsides of thick pine forest behind. The east side is characterized by road cuts or slopes adjacent to the roadway with little variety in the sparse vegetation.

Section IV is broad open plain. To the west Mt. Shasta can be seen in the distance beyond the low forested ridges and flat plain containing pasture land and scrub vegetation. Several houses are visible as one nears Adin and telephone/electric lines are visible along several of the intersecting roads.

Section V is the town of Adin. The town is located on the edge of the plain that extends to the west and south, with low hills adjacent to the town forming the northern and eastern boundaries.

3.11.3 USDA Forest Service Visual Quality Objectives

The Forest Service has designated VQOs for the area based on the following: Variety Class, or the existing character of the landscape; Sensitivity Level, or people's concern for scenic quality; and classification of views into Distance Zones. Visual Quality Objectives for the Hayden Hill Project site are shown on Figure 3.11-3. Visual Quality Objectives for the power line corridor are shown on Figure 3.11-4.

3.11.3.1 Variety Classes

There are three classifications that describe landscape character: Class A - Distinctive; Class B - Common; and Class C - Minimal. Variety Classes for the Project area and power line corridor are Class B and C. Class B areas contain variety in form, line, color, and texture but are not outstanding in visual quality. Class C landscapes are areas where features have little change in form, line, color, and texture.

Hayden Hill Project
The majority of the Project surroundings are Class B and C landscapes.

Hayden Hill Power Line
For the most part, lands along the east side of Highway 139 where the power line ROW is located are Class C, while lands along the west side from Hayden Hill Road north to Little Gold Hill are Class B. The exception to this is the first mile of Highway 139 north of Hayden Hill Road where both sides of the road are Class B. From Little Gold Hill to Adin, lands on both sides of Highway 139 are predominantly in Class C.

3.11.3.2 Sensitivity Levels

There are three levels of sensitivity in the Visual Management System: Level 1 is rated as having the highest sensitivity; Level 2 is average; and Level 3 is lowest. These levels are rated by type of travel route involved, the concern of the viewers for scenic quality, and the number of viewers using the route.

Hayden Hill Project
Sensitivity levels, as determined by the USFS, for the majority of the Project area are high (Level 1) due to the close proximity of State Highway 139 (Figure 3.11-3). As previously mentioned, this road is used as a travel route to Reno for tourists from British Columbia, Washington and Oregon.

The Project area is also rated Level 1, by the USFS, for the forest access and other unimproved roads located south and west of Hayden Hill. These roads do not receive the larger volumes of traffic that

Highway 139 does, and are used minimally and almost exclusively for administrative use by the USFS, BLM, and for access by deer and antelope hunters during the big game season. From a visual assessment standpoint, these roads are not as critical as Highway 139 due to the low level of use and the potentially low concern for views by users of these roads.

A portion of Preston Canyon facing west is designated as Sensitivity Level 3 (Figure 3.11-3). It has been rated from the secondary access road that is situated at the bottom of the canyon. This route is basically used for administrative use and access for hunters. Use of this road is minimal.

Hayden Hill Power Line

State Highway 139 is classified as a Level 1 road since it is an interstate travel route used by tourists and recreationists from Oregon, Washington and British Columbia who are either traveling to Reno or to various recreation sites. Traffic tends to be concentrated on weekends and the volume is relatively light (average daily trips by the Bieber turnoff in 1989 were 260) (Shoun 1990b). While there is some truck traffic, most trucks use Route 395 or other routes because the road grades leaving Susanville are steep (Figures 3.11-1 and 3.11-2).

In the 1968 Lassen County General Plan, the Route 139 corridor is classified a "scenic highway corridor" and the section between Hayden Hill Road and the Bieber turnoff is identified as a prime recreation area. In addition, the 1987 draft EIS for the Modoc National Forest Land and Resource Management Plan identifies Highway 139 as a Level 1 travel route.

3.11.3.3 Distance Zones

Distance zones, or the distance between viewer and object viewed, are defined as: Foreground (up to 1/2 mile); middleground (1/2 to 3 miles); and distant or background views (over 3 miles). In general, visual changes to a landscape are more evident and provide greater contrast to the existing landscape the closer the viewer is to the proposed changes.

Hayden Hill Project

Hayden Hill Road, the proposed access to the Project, is an existing County administered dirt/gravel road. The intersection of this road with Highway 139 is within the foreground when viewed from Highway 139. The main Project area, occurs as a middleground view for an approximately 0.7 mile portion of Highway 139 north of the site (Sections 1 and 12, T37N, R9E, and Sections 7 and 18, T37N, R10E). The top of Hayden Hill may also be seen as a background or distant view from Highway 139 by Little Gold Hill near the intersection of County Road A2.

There are no views to Bunselmeier Spring and into Preston Canyon from Highway 139. These areas will contain the production wells for the Project water supply.

Hayden Hill Power Line

The entire length of the proposed transmission line is within the foreground zone of Highway 139 or Highway 299 in Adin. Specific distance zones have been identified for the landscape areas that can be viewed from Highway 139 traveling both north and south (Figure 3.11-4).

3.11.3.4 Visual Quality Objectives

Variety class, sensitivity levels, and distance zones are combined to establish VQOs. Visual Quality Objectives are classified into five visual resource management categories established by the USFS. These categories are Preservation, Retention, Partial Retention, Modification, and Maximum Modification. These categories have specific management criteria that relate to the amount and type of change that may be acceptable ranging from preservation (little or no change) to maximum modification (high level of change appropriate).

Hayden Hill Project

Retention has been mapped on the west-facing slope of Hayden Hill Road where it intersects Highway 139 (Figure 3.11-3). This objective allows for activities or modifications that are not visually evident. Those activities should only repeat form, line, color, and texture found in the characteristic landscape.

The land surrounding Hayden Hill has a VQO designation of Partial Retention (Figure 3.11-3). Partial Retention allows for modifications which are visually subordinate to the surrounding landscape. Activities may introduce form, line, color or texture infrequently found in the characteristic landscape, but should remain subordinate to the characteristic landscape. Hayden Hill (Sections 1 and 36, T37N, R9E, and Sections 6 and 31, T37N, R10E.) occurs on private and BLM land and subsequently was not rated by the USFS.

A large portion of Preston Canyon has a VQO of Modification. Changes to this landscape may visually dominate the original landscape character but should borrow from and remain compatible with the natural surroundings. Roads and structures in this area should remain visually subordinate wherever possible.

Hayden Hill Power Line

The power line corridor consists of a twenty foot ROW within the Highway 139 ROW on the east side of the highway. The Highway 139 ROW varies in width as it travels from Hayden Hill Road to Adin, but generally averages 50-feet from the centerline of the highway. Virtually the entire length of the power line corridor has a VQO designation of Partial Retention (Figure 3.11-4).

For the first mile along Highway 139, from the junction of Hayden Hill Road and Highway 139, the power line passes through an area with a VQO of Retention. A Retention objective provides for management activities which are not visually evident. Management activities may only repeat form, line, color, and texture found in the surrounding characteristic landscape. This area is in the Modoc National Forest. The USFS rated this area in the Class B, or Common, Variety Class, which, with foreground views and Level 1 roadway, requires a VQO of Retention. From the regional perspective of the entire Modoc National Forest, it is understandable how the USFS reached this conclusion. However, closer inspection reveals there are steep slopes and sparsely vegetated and eroded road cuts along this section of highway which would affect this rating. It is the judgement of Design Workshop, Inc., the independent consultant conducting the visual assessment, that except for the steep slopes, this area is more typical of a Class C, or Minimal, Variety Class landscape.

3.11.4 Visual Absorption Capability (VAC)

Another component of the USDA Visual Resource Management System is the VAC. This refers to a landscape's ability to absorb visual or physical change. Once VACs have been determined, they are combined with VQOs to determine the total visual constraints to modification. This allows a project to be evaluated against the management objectives for the area along with the landscape's ability to accept proposed change associated with a specific project.

Elements that determine an area's VAC may include (among other things) slope, vegetative pattern diversity, vegetative screening ability, vegetative regeneration potential, and soil characteristics such as, color, productivity, and erosion potential. These elements and their relative importance to each other vary depending on the characteristics of the existing landscape.

The VAC is rated as either high, moderate, or low. Areas that have high VAC have a high ability to accept modification without visual degradation. Landscapes with low VAC are not able to visually "absorb" activities without specific mitigation measures.

Hayden Hill Project

Disturbances on the steep slopes, although of limited exposure, that face Highway 139 will be readily apparent to the viewer. The Jeffrey pine vegetation type on the north-facing slopes have a high potential for screening, but the light to moderate soil colors will have high contrast against the dark color and uniform vegetation pattern. Typically, disturbance on steep slopes is more difficult to mitigate. However, vegetation regeneration potential on these slopes would be moderate given the right conditions through reclamation efforts, resulting in an overall moderate VAC rating.

The south and west facing slopes and flatter areas have little visual variety in pattern and low screening potential. Soils will moderately contrast with the lighter colors of the sagebrush and grasses found on these slopes. Establishment of vegetation would be at a moderate rate, resulting in a moderate to low VAC rating.

Hayden Hill Power Line

The placement of the power line within the Highway 139 ROW will have a visual impact on the viewing public. The power line use, however, will be a relatively low impact use of the land. The 20 foot ROW will not be cleared, poles will be placed 200-450 feet apart, and portions of the ROW already have power/telephone lines. The low impact of the power line will place little stress on the landscape's VAC.

Based on existing soils and vegetation properties, there are few areas in the power line ROW that have low vegetation regeneration potential given the low impact of construction and maintenance of the power line. Vegetation screening potential varies along the ROW, but because of the nature of the power line, the VAC is generally high.

There are two sections of the power line corridor (Sections II and IV) in which the traveler will have long views of the power line (Figure 3.11-2). This is due primarily to the long sight distance along the road and the lack of vegetative screening. In both these sections power lines or telephone poles already exist along the ROW or along nearby visible roads. Due to the fact that wooden poles do not provide a sharp contrast to the surrounding landscape and the low intensity impact of the power line, the VAC remains moderate to high in these areas.

3.12 Transportation

The transportation analysis for the Hayden Hill Project addresses the Federal, State and County highway and road network. These are the only elements of the area transportation system likely to be affected by the Project.

3.12.1 Highways to be Affected

Figure 3.12-1 illustrates the four State highways and two County roads included in the transportation area of influence for the proposed Hayden Hill Project. They are: 1) U.S. Highway 395 north from the California and Nevada State line to just south of Susanville and, to a lesser degree, on north to Alturas in Modoc County; 2) California Highway 139 from Susanville north to Adin; 3) California Highway 299 from McArthur in Shasta County to Alturas in Modoc County; 4) California Highway 36 as it connects 395 to 139; 5) Lassen County Road 422, known as County Road A2 or the Susanville Road; and 6) the

County-maintained Hayden Hill Road. Also affected, are Termo-Grasshopper Road (Lassen County Road 513) and Preston Canyon Road.

This section discusses the highways, present condition of each of these roads, the plans of Lassen County and Caltrans for these roads, and related information concerning highways in the area.

3.12.1.1 Levels of Service

Caltrans uses the U.S. Department of Transportation's system of measuring levels of service, grading them from level A, the least congested, to F, where traffic moves slowly in stop-and-go patterns. Other measures of traffic levels are used in highway planning--flow rate, volume-capacity ratio--but level of service (LOS) is a composite of the design of the highway and the volume and flow of traffic (Bennett 1990). The LOS does not reflect the condition of the road surface, only the flow of traffic (Strode 1990). This analysis uses LOS as computed by Caltrans to depict the relative ease with which traffic flows on the highways in question.

Traffic is also measured by a straight-forward count of traffic flowing over a counter. Counts in both directions of traffic are taken at various hours and days of the week and are combined into an averaged daily traffic count (ADT). This document uses the most recent ADT figures quoted by Caltrans, from 1989.

In addition, Caltrans determines a Concept level of service to refer to the LOS they desire to provide on a stretch of road. Sometimes the Concept level of service is achieved or exceeded, sometimes it is not. If the Concept LOS is higher than the existing or anticipated LOS, the department will attempt to budget monies to improve the roadway by adding or widening driving lanes, adding left-turn lanes, or improving shoulders. If the Concept LOS is lower than existing conditions, the department will seek only to maintain the roadway through pothole patching and resurfacing (Bennett 1990). Thus, by comparing the existing LOS with the Concept LOS we can anticipate, to some degree, Caltrans' anticipated improvements to the road.

3.12.1.2 Carpooling

Caltrans offers information and a number of programs to facilitate carpooling. Lassen County population is sparse and carpooling is more difficult than in urban areas. Caltrans will help an individual or a company match carpoolers. Lassen County also offers assistance to those who want to share rides. California grant money is available from the Petroleum Violation Escrow Account to pay for up to 70 percent (or $18,000) of the purchase of a new van or 60 percent of lease costs. According to Caltrans the account has funds available and Caltrans received no applications for the money to date from employers or residents of Lassen County (Severson 1990).

3.12.1.3 Bridges and Culverts

Highway structures like bridges and culverts can be the weak links in the chain of highways if they were designed and built during a time when truck weight limits and widths were less than today. Vehicles carrying loads above California's weight limits must apply for and receive permits to use the public roads, detailing the route to be taken so that Caltrans can evaluate the adequacy of the road and structures. Because roads are often designed with significant safety margins, permits sometimes allow weights as much as 150 percent above the legal limit, so long as the axle configuration and the route chosen do not present a hazard to the road and structures or to the traveling public. According to Caltrans, the structures on Highways 299, 139 and U.S. 395 are able to handle all legal-weight loads carried by other roads in the nation (Dunn 1990).

3.12.1.4 Vehicles Carrying Hazardous Materials

The California Health Services Department issues regulations concerning the registration of carriers of hazardous materials. These regulations are enforced by the California Highway Patrol which registers the carriers (Compton 1990). The U.S. Department of Transportation requires companies to train the drivers of shipments of hazardous materials (Webb 1990). The California Department of Motor Vehicles requires drivers of vehicles carrying hazardous materials to pass a test to gain an endorsement on their commercial driver's licenses (Harvey 1990a). Trucks must carry a manifest listing the type of material being carried to comply with EPA regulations (Holmes 1990). Shipments of all hazardous materials, such as sodium cyanide, would fall under the jurisdiction of these five agencies. In addition, motor carriers transporting reportable quantities of sodium cyanide must carry $5 million in insurance. Section 172.101 of Title 49 of the CFR defines a reportable quantity of sodium cyanide as a package of 10 pounds. California has adopted these regulations. Therefore they apply whether or not the shipment is interstate or intrastate (Horgan 1990).

3.12.1.5 Traffic Within Cities and Towns

None of the cities or towns in Lassen County has highway bypasses built to carry traffic away from the business or residential areas. Therefore, all traffic will be routed directly through the population centers of the County (Harvey 1990a, b). The State has no projects in its five-year plan (State Transportation Improvement Program) to alter the routing through communities in Lassen or Modoc Counties (Strode 1990).

3.12.2 U.S. Highway 395

United States Highway 395 enters the southern tip of Lassen County as a four-lane divided highway for the brief stretch to Hallelujah Junction. From this point north to the junction just south of Susanville and on north to Alturas, the highway is a two-lane road with a 24-foot-wide driving surface and graded, graveled shoulders. Starting at the most northern point on this highway for which data was gathered, the ADT varies from 1,200 just south of Alturas, to 6,200 south of Johnstonville, 3,900 south of Herlong and 7,200 at the junction with California Highway 70 at Hallelujah Junction. Lassen County Road 395, Route A3 from Buntingville to Standish, carries some traffic from 395 because it is the shorter route. The State and County have discussed dedicating this road to the State system as a part of U.S. Highway 395 (Bennett 1990).

The combination of traffic counts, and design and condition of the road, yields levels of service varying from A at the four-laned section to D on the stretch of the road roughly from Constantia to Milford. Caltrans anticipates significant deterioration of traffic conditions by the year 2010, lowering the LOS to E from Constantia to Milford (Strode 1990). (At level of service E, traffic on a road designed to allow travel at 70 miles per hour has traffic moving at a rate of 30 miles per hour [Bennett 1990].) Because the Concept LOS is B for the entire length of U.S. 395, Caltrans would like to add two new lanes to upgrade the road to a divided, four-lane highway from Hallelujah Junction to Litchfield. However, the five-year plan includes only the minor improvements of four new passing lanes and one curve-improvement. Above Litchfield the LOS rises to A and B all the way to Alturas. Caltrans plans to add 30 to 40 miles of passing lanes on this route, if the budget permits (Strode 1990). Two structures near Doyle are slightly below the standard necessary to carry all legal and permitted loads, but so slightly as to be of no concern (Dunn 1990).

3.12.3 California Highway 139

Highway 139 is a relatively narrow road with 11-foot lanes. Its surface is poor and cracked enough so that Caltrans recently has sealed the surface and covered it with rock chips to prevent further deterioration. Resurfacing would be desirable (Bennett 1990). Caltrans and Lassen County have discussed dedicating 139 as a County road, because its use is mostly local in nature and because it carries low traffic volumes (Strode 1990). Lassen County has declined to accept the road because the County has insufficient funds to maintain it (Harvey 1990a). Averaged daily traffic counts (ADT) range from a high of 790 just north of the college at Susanville to a low of 260 near Adin (Peterson 1990).

The Concept LOS for Highway 139 is D. Because the present LOS is A for most of its length, Caltrans does not plan any upgrades to the road. The only section of the road which is considered a problem by Caltrans is the first few miles north of Susanville which has steep grades (6 percent) and several switchbacks (Strode 1990). This section is also subject to occasional rock slides during wet weather. It is sometimes snow-covered and icy and is not maintained, either in terms of surface condition or of snow removal, at the same level as U.S. 395 or Highway 299. Because of the steep grade north of Susanville, some traffic uses U.S. 395 north to Termo, turning west on the Termo-Grasshopper Road, to connect again with Highway 139 (Harvey 1990a).

3.12.4 California Highway 299

This two-lane road is structurally adequate with 12-foot lanes, few potholes, and a higher level of maintenance than Highway 139. Traffic volumes vary from a low of 1,050 ADT from Bieber to Adin to a high of 3,000 ADT between Bieber and McArthur in Shasta County (Bennett 1990). The road is subject to blowing snow in the winter (Peterson 1990).

The Concept LOS for Highway 299 from Alturas to McArthur is D. The LOS ranges from A near Canby to C near Bieber. Because the present LOS is higher than the Concept LOS, Caltrans does not plan major construction to improve capacity. The five-year plan includes three projects: 1) Installation of a 40-foot-wide bridge on a new alignment on Clover Swale Creek between Canby and Alturas; 2) a left-turn lane at the Day Road junction at the western Lassen County line; and 3) widening a box culvert about three miles west of Alturas (Strode 1990).

3.12.5 California Highway 36

Part of this highway in Susanville is a four-lane road with shoulders that vary from no shoulder to ten feet in width; it narrows to a two-lane road with two lanes with eight-foot shoulders. About one mile of the road was rehabilitated a year ago and the rest is listed in the Caltrans plan, though as yet unbudgeted, for rehabilitation (Robinson 1990). Its surface is good and its bridges and culverts can carry full permitted weight loads (Richardson 1990).

The Concept level of service is D in the four-lane section and C in the two-lane section. The present level of service is called MI, or maintain and improve, equivalent to level of service F. A study is underway to realign Highway 36. This new roadway will probably not be built until consensus is reached between the City of Susanville, Lassen County, and Caltrans on the alignment. No expenditures to improve capacity are likely on the present alignment beyond adding turning lanes or signal lights, in part because the new alignment is being considered, and in part because priority has been given to widening Highway 395 south toward Reno. The highway receives class 1 maintenance in the winter, the highest level provided by Caltrans (Corford 1990).

3.12.6 County Road 422, County Road A2

County Road 422 is a paved road with 10-foot lanes and narrow, soft shoulders. The surface of the road is badly cracked and the County has filled the cracks, to prepare the road for sealing and coating with rock chips. The County considers the road to be in poor-to-moderate condition and plans to overlay and slightly widen the road in two or three years. The County has no recent count of traffic. The road has no weight restrictions. Two culverts at Willow Creek need to be enlarged to carry water adequately (Harvey 1990a).

3.12.7 Hayden Hill Road

The main access to the proposed Hayden Hill Project site will be Hayden Hill Road. This road runs four miles south and west from California Highway 139.

The transportation planner for Lassen County's Department of Public Works describes the road as being in poor condition. He said the road varies in width from 8 to 12 feet, with no shoulder, no crown for drainage, and no gravel or other surface. The road is bladed perhaps once a year and is not plowed in the winter. Although the County performs the little maintenance the road receives, the County does not own the ROW for the road, the road is a public road created by implied dedication. Instead, the County has a prescriptive right to use and maintain only the road as it now exists. Because the County has no ROW it cannot widen or alter the road beyond surface plowing. In order to widen the road, ROW would have to be acquired from the USFS and from a few private property owners whose land is transversed by the road (Shoun 1990).

3.13 Recreation

The primary area of influence for recreation includes the Project site and alternative locations, water supply locations, the Willow Creek Campground, and the transportation corridors. Information concerning recreation uses on the Project site and vicinity were obtained from the USFS and BLM.

3.13.1 Project Area

There are no developed recreation resources in the Hayden Hill Project area. The only developed recreation resource in the nearby vicinity is the USFS Willow Creek Campground described below. Under current conditions, no improvements or establishment of recreational facilities are anticipated or warranted by demand levels. Current dispersed recreation uses in the proposed Hayden Hill Project area include the following:

3.13.1.1 Hayden Hill Town Site and Mining District

The Hayden Hill Mining District has historically been one of the most important mining areas in the region. The old Highgrade Mining District, near New Pine Creek and the Winters Mining District north of Adin, are the only other notable historic mining areas within the BLM planning area (BLM 1983).

The mining district consists primarily of numerous old foundations and a cemetery. The abandoned mines present a safety hazard to people who enter them (Bouse 1990). Hayden Hill is not considered a destination recreation attraction. However, this historic mining site is identified on many area recreation and tourist maps and in many brochures, therefore it receives a certain amount of use from visitors who are recreating in the general area. There are no statistics concerning the numbers of visitors to Hayden Hill. Although there are several small gold mines near Adin, the Hayden Hill historic mining district is a unique resource in the area (Bouse 1990; Teeter 1990).

3.13.1.2 Fire Tower

The California Division of Forestry fire lookout tower that is located on Hayden Hill within the Project area receives a substantial number of visitors, primarily in summer months. There are several other fire lookout towers in the Lassen and Modoc National Forests (Bouse 1990; Teeter 1990).

3.13.1.3 Rockhounding

The Project site experiences some rockhounding use, in conjunction with the old mining district. No statistics exist concerning this use (Bouse 1990).

3.13.2 Vicinity

3.13.2.1 Hunting and Angling

The Project site and vicinity is used for deer hunting and to a lesser extent for antelope and small game hunting. The CDFG has identified angling as a recreation resource within the general Project area. No statistics exist concerning the small game hunting and angling potential within the general Project area (Bouse 1990; Teeter 1990).

3.13.2.2 Bird Watching

Minimal bird watching occurs at the wildlife refuge to the south of the site, although this is not considered a significant resource for that purpose (Bouse 1990).

3.13.2.3 Hiking and Picnicking

The meadows and riparian areas on both public and private lands along 139 north of the Hayden Hill Road turnoff receive substantial hiking and picnicking use (Bouse 1990).

3.13.2.4 Willow Creek Campground

The USFS Willow Creek Campground and Picnic Area located 1 1/2 miles south of the Hayden Hill Road turnoff on Highway 139 is open from May to mid-October. The Campground can accommodate eight units including travel trailers. Facilities include toilets, piped water, tables, benches, and stoves (USFS 1983a). United States Forest Service Campgrounds have a 14-day stay limit (Bouse 1990).

3.14 Noise

Noise is often described as unwanted sound, and thus is a subjective reaction to characteristics of a physical phenomenon. Researchers have generally agreed that A-weighted sound pressure levels (sound levels) are well correlated with subjective reactions to noise. Variations in sound levels over time are represented by statistical descriptors, and by time-weighted composite noise metrics such as Day-Night Average Level (Ldn). The unit of sound level measurement is the decibel (dB), sometimes expressed as dBA. Brown-Buntin Associates, Inc. performed an environmental noise analysis at the Hayden Hill site (Brown-Buntin Associates 1990). In this analysis, A-weighted sound pressure levels are used to describe environmental noise unless otherwise indicated. Figure 3.14-1 illustrates sound levels associated with ordinary noise sources. Refer to the Glossary, Chapter 9.0 for definitions of the terminology used for this analysis.

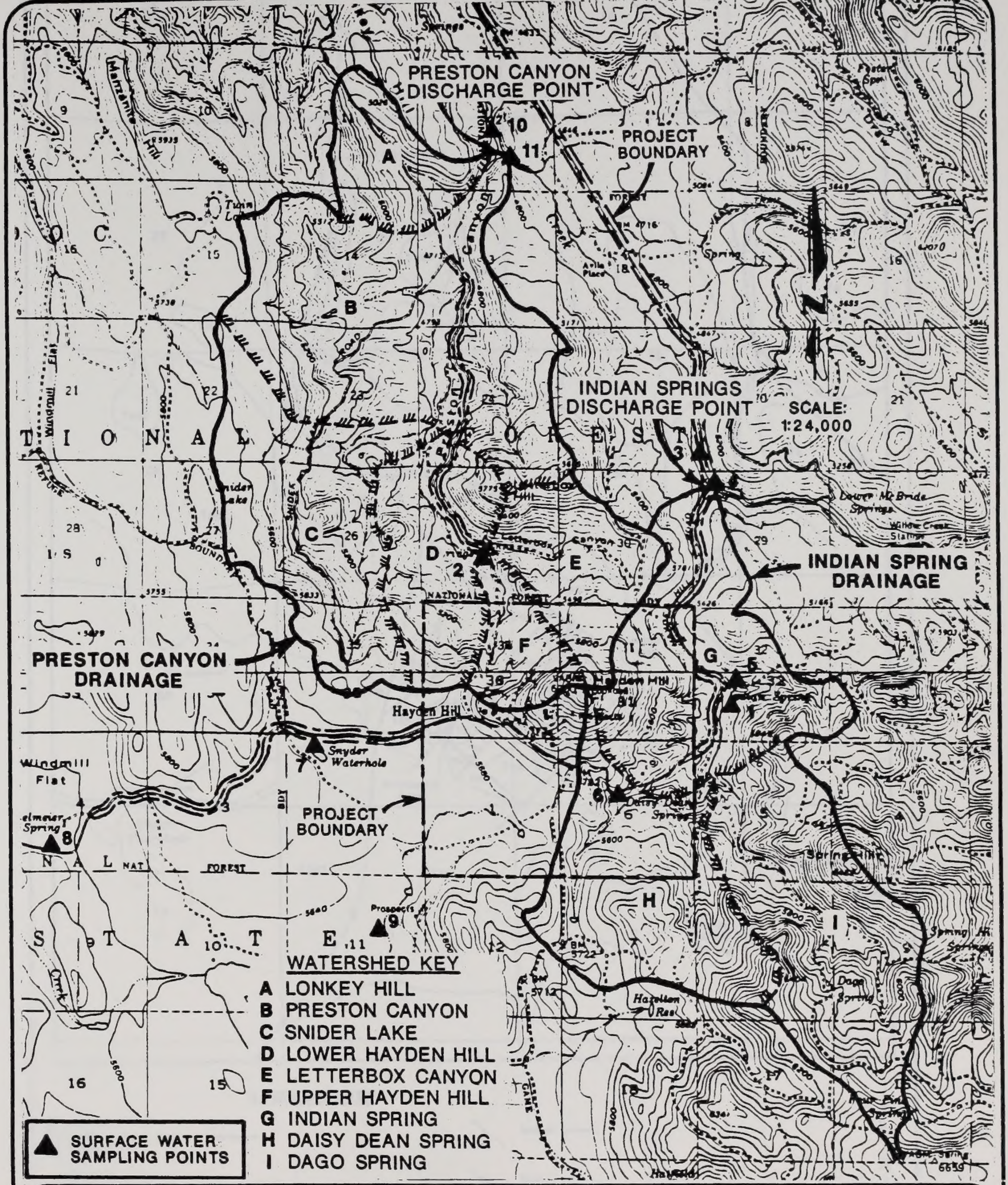
3.14.1 Ambient Noise Levels

The Noise Element of the Lassen County General Plan contains performance standards for locally regulated noise sources, including the Proposed Action operations (Lassen County 1990). Ambient noise levels in the Project vicinity are represented by the noise level measurements made for the Lassen County Noise Element. On July 13-14 1988, noise levels were measured at the Willow Creek Campground, east of the Project site on Highway 139 (Brown-Buntin Associates 1989). The ambient noise sources noted at that time were wind and distant traffic. The average noise level (L_{eq}) during the daytime was reported to be 47 dB. The L_{eq} at nighttime was reported to be 30 dB. The estimated day-night average sound level, (L_{dn}) was 45.4 dB. Table 3.14-1 lists the ambient noise level measurement results obtained for the Noise Element. Based upon these data, the existing noise environment may be described as very quiet, especially at night.

TABLE 3.14-1

AMBIENT NOISE LEVEL SURVEY RESULTS
Willow Creek Campground
July 1, 1988

Date	Time	Sound Level, dB					Source
		L_{max}	L_{min}	L_{eq}	L_{90}	L_{50}	
7/13	1719	56	39	47	42	45	Wind, traffic
7/14	0242	32	26	30	26	28	Nearby auto


PRESTON CANYON DISCHARGE POINT
PROJECT BOUNDARY
INDIAN SPRINGS DISCHARGE POINT
SCALE: 1:24,000
INDIAN SPRING DRAINAGE
PRESTON CANYON DRAINAGE
PROJECT BOUNDARY
A
B
C
D
E
F
G
H
I
1
2
3
4
5
6
7
8
9
10
11
Hayden Hill
Snyder Waterhole
Windmill Flat
Daisy Dean Spring
Dago Spring
Lower McBride Springs
Twin Lake
Snider Lake
Prospects
Hazelton Res
NATIONAL FOREST
STATE
WATERSHED KEY
A LONKEY HILL
B PRESTON CANYON
C SNIDER LAKE
D LOWER HAYDEN HILL
E LETTERBOX CANYON
F UPPER HAYDEN HILL
G INDIAN SPRING
H DAISY DEAN SPRING
I DAGO SPRING
▲ SURFACE WATER SAMPLING POINTS

PROJECT NO.
29001

DATE
11/90

REVISION
0

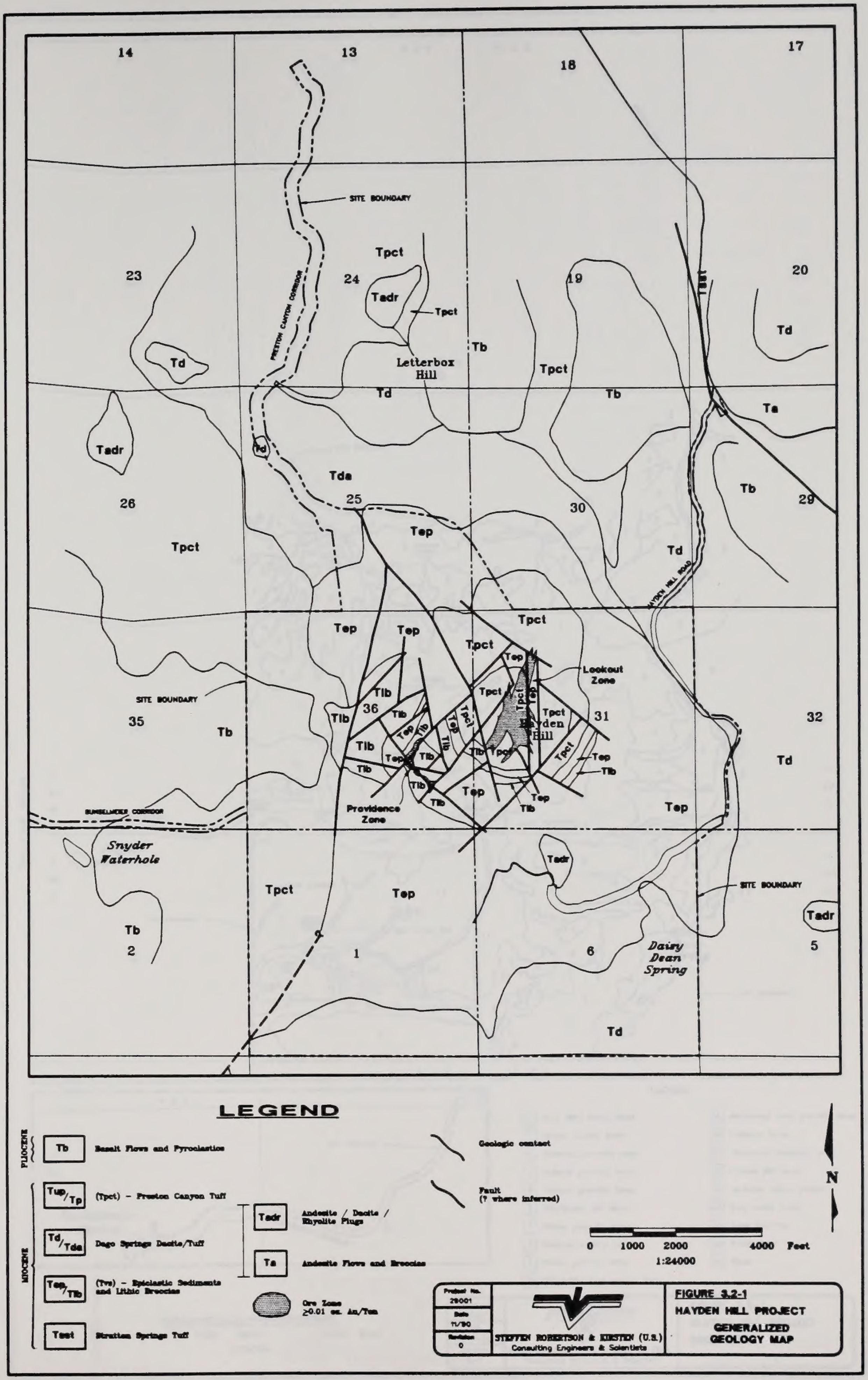
PREPARED BY:

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

FIGURE 3.1-1

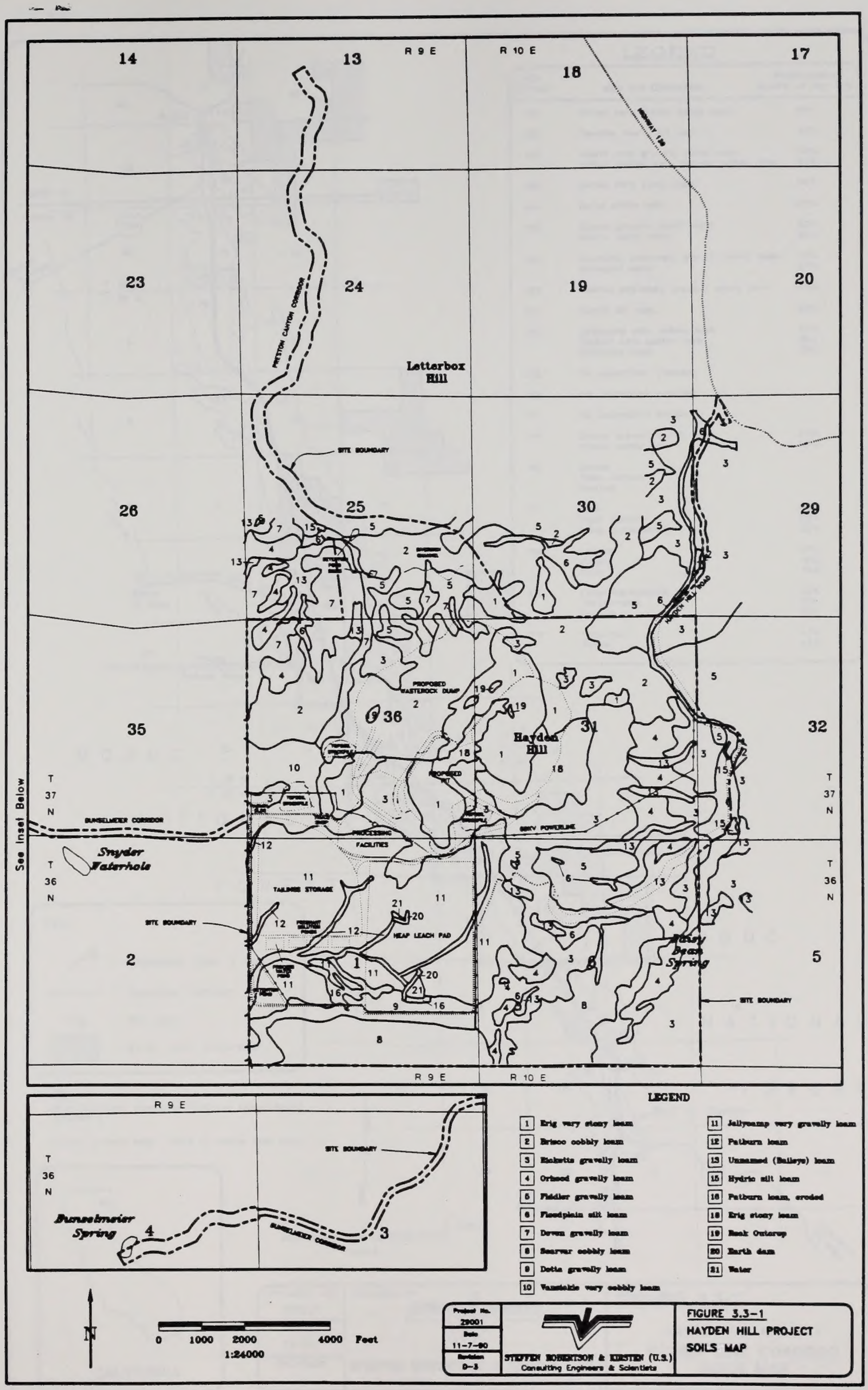
HAYDEN HILL PROJECT

DRAINAGES IN THE PROJECT AREA



14
13
18
17
23
24
19
20
26
25
30
29
35
36
31
32
2
1
6
5
Tpct
Tadr
Td
Tb
Ta
Tda
Tep
Tlb
Tsst
SITE BOUNDARY
PRESTON CANYON CORRIDOR
Letterbox Hill
HAYDEN HILL ROAD
Lookout Zone
Hayden Hill
Providence Zone
SUNSELLMEIER CORRIDOR
Snyder Waterhole
Daisy Dean Spring
LEGEND
PLIOCENE
MIOCENE
Tb Basalt Flows and Pyroclastics
Tup/Tp (Tpct) - Preston Canyon Tuff
Td/Tda Dago Springs Dacite/Tuff
Tep/Tlb (Tvs) - Epiclastic Sediments and Lithic Breccias
Tsst Stratton Springs Tuff
Tadr Andesite / Dacite / Rhyolite Plugs
Ta Andesite Flows and Breccias
Ore Zone ≥0.01 oz. Au/Ton
Geologic contact
Fault (? where inferred)
0 1000 2000 4000 Feet
1:24000
N
Project No. 29001
Date 11/90
Revision 0
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

FIGURE 3.2-1
HAYDEN HILL PROJECT
GENERALIZED GEOLOGY MAP


14
13
R 9 E
R 10 E
18
17
HIGHWAY 139
23
24
19
20
PRESTON CANYON CORRIDOR
Letterbox Hill
SITE BOUNDARY
26
25
30
29
HAYDEN HILL ROAD
PROPOSED WASTEROCK DUMP
36
35
Hayden Hill
31
32
T 37 N
T 36 N
See Inset Below
BUNSELMEIER CORRIDOR
Snyder Waterhole
PROPOSED PIT
PROCESSING FACILITIES
69KV POWERLINE
TAILINGS STORAGE
HEAP LEACH PAD
SITE BOUNDARY
Pasty Bean Spring
2
5
R 9 E
R 10 E
Bunselmeier Spring
BUNSELMEIER CORRIDOR
4
3
N
0
1000
2000
4000
Feet
1:24000
LEGEND
1 Erig very stony loam
2 Brisco cobbly loam
3 Ricketts gravelly loam
4 Orhood gravelly loam
5 Fiddler gravelly loam
6 Floodplain silt loam
7 Devon gravelly loam
8 Searvar cobbly loam
9 Dotta gravelly loam
10 Vamstokie very cobbly loam
11 Jellycamp very gravelly loam
12 Patburn loam
13 Unnamed (Baileys) loam
15 Hydric silt loam
16 Patburn loam, eroded
18 Erig stony loam
19 Rock Outcrop
20 Earth dam
21 Water

Project No. 29001
Date 11-7-90
Revision 0-3

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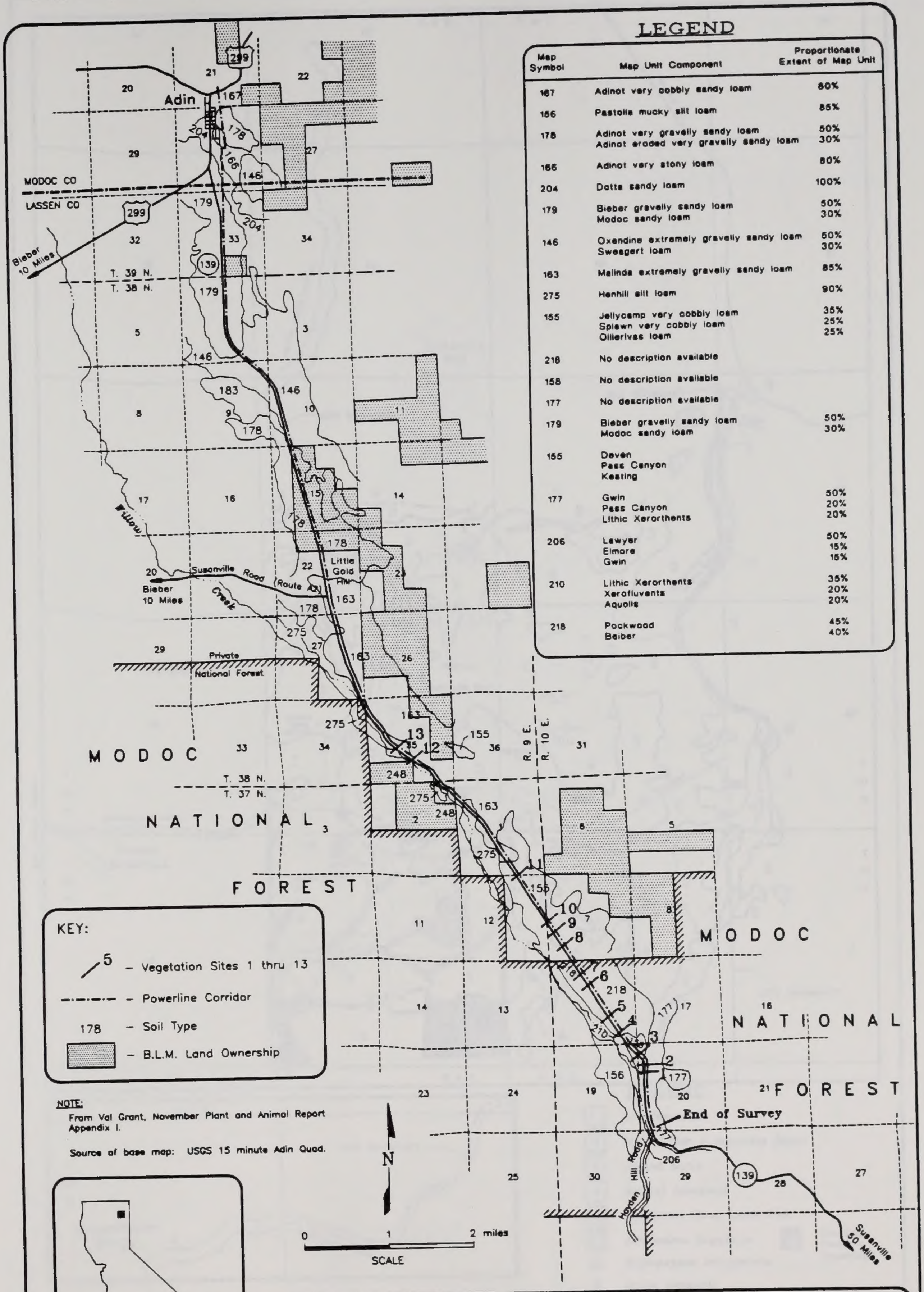
Consulting Engineers & Scientists

FIGURE 3.3-1
HAYDEN HILL PROJECT
SOILS MAP


Adin
MODOC CO
LASSEN CO
299
139
Bieber 10 Miles
T. 39 N.
T. 38 N.
T. 37 N.
R. 9 E.
R. 10 E.
Willow Creek
Susanville Road (Route A2)
Bieber 10 Miles
Little Gold Hill
Private
National Forest
MODOC NATIONAL FOREST
MODOC NATIONAL FOREST
End of Survey
Hayden Hill Road
Susanville 50 Miles
N
0
1
2 miles
SCALE
CALIFORNIA

LEGEND

Map Symbol	Map Unit Component	Proportionate Extent of Map Unit
167	Adinot very cobbly sandy loam	80%
156	Pastolle mucky silt loam	85%
178	Adinot very gravelly sandy loam Adinot eroded very gravelly sandy loam	50% 30%
166	Adinot very stony loam	80%
204	Dotta sandy loam	100%
179	Bieber gravelly sandy loam Modoc sandy loam	50% 30%
146	Oxendine extremely gravelly sandy loam Sweagert loam	50% 30%
163	Malinda extremely gravelly sandy loam	85%
275	Henhill silt loam	90%
155	Jellycamp very cobbly loam Splawn very cobbly loam Ollierlves loam	35% 25% 25%
218	No description available	
158	No description available	
177	No description available	
179	Bieber gravelly sandy loam Modoc sandy loam	50% 30%
155	Deven Pass Canyon Keating	
177	Gwin Pass Canyon Lithic Xerorthents	50% 20% 20%
206	Lawyer Elmore Gwin	50% 15% 15%
210	Lithic Xerorthents Xerofluvents Aquolls	35% 20% 20%
218	Pockwood Beiber	45% 40%

KEY:

5 – Vegetation Sites 1 thru 13

– Powerline Corridor

178 – Soil Type

▨ – B.L.M. Land Ownership

NOTE:
From Val Grant, November Plant and Animal Report Appendix I.

Source of base map: USGS 15 minute Adin Quad.

PROJECT NO.	PREPARED BY:
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11/90	
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0	

FIGURE 3.3-2

HAYDEN HILL PROJECT

POWER LINE CORRIDOR SOILS MAP

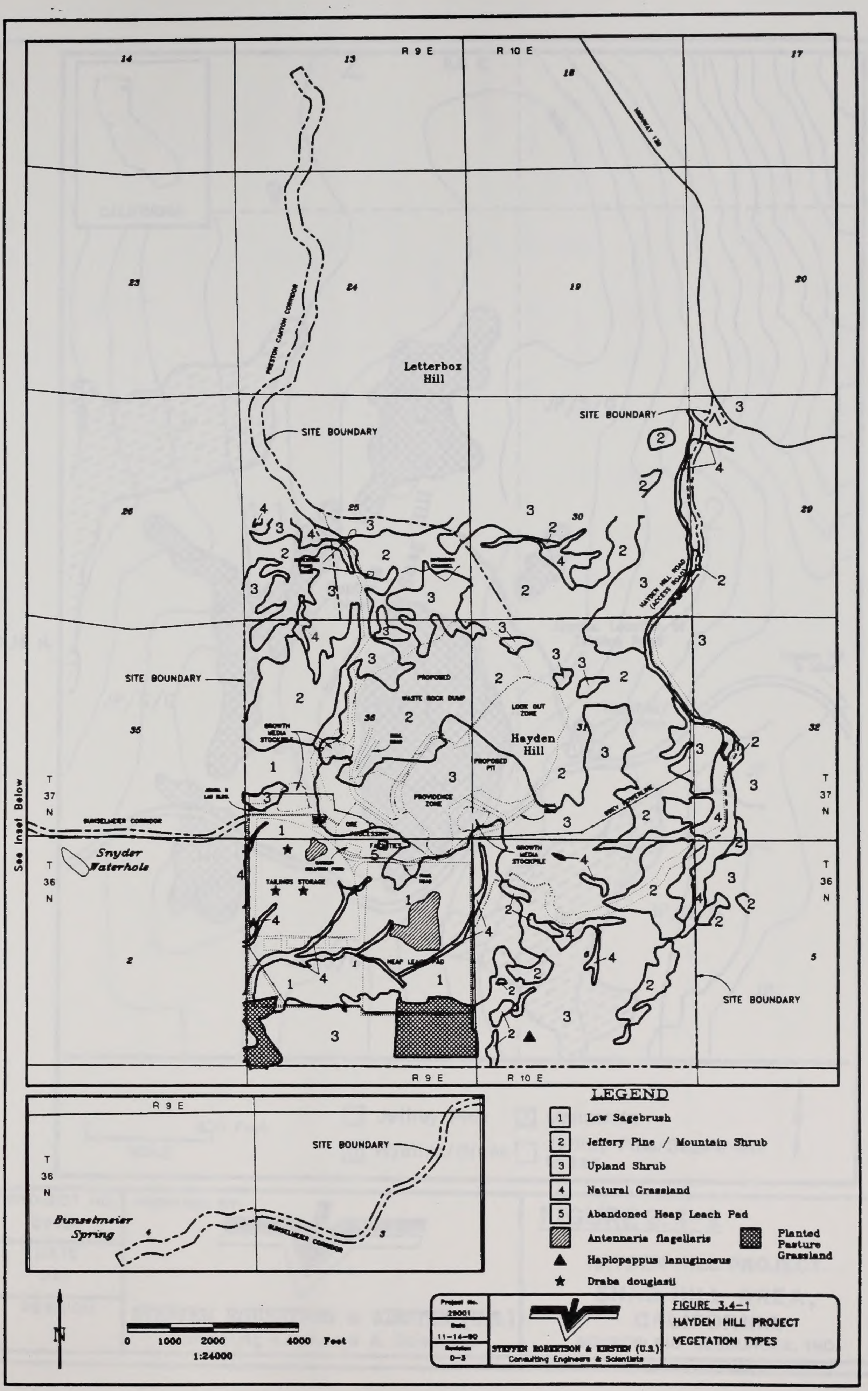
R 9 E
R 10 E
14
13
18
17
HIGHWAY 139
23
24
19
20
PRESTON CANYON CORRIDOR
Letterbox Hill
SITE BOUNDARY
26
25
30
29
HAYDEN HILL ROAD (ACCESS ROAD)
PROPOSED WASTE ROCK DUMP
LOOK OUT ZONE
Hayden Hill
35
36
31
32
GROWTH MEDIA STOCKPILE
PROPOSED PIT
PROVIDENCE ZONE
ORE PROCESSING FACILITIES
TAILINGS STORAGE
HEAP LEACH PAD
BUNSELMEIER CORRIDOR
Snyder Waterhole
See Inset Below
T 37 N
T 36 N
2
5
1
2
3
4
5
Bunselmeier Spring
LEGEND
1 Low Sagebrush
2 Jeffery Pine / Mountain Shrub
3 Upland Shrub
4 Natural Grassland
5 Abandoned Heap Leach Pad
▨ Antennaria flagellaris
▩ Planted Pasture Grassland
▲ Haplopappus lanuginosus
★ Draba douglasii
N
0 1000 2000 4000 Feet
1:24000
Project No. 29001
Date 11-14-90
Revision 0-3
STEFFEN ROBERTSON & KIRSTEN (U.S.)
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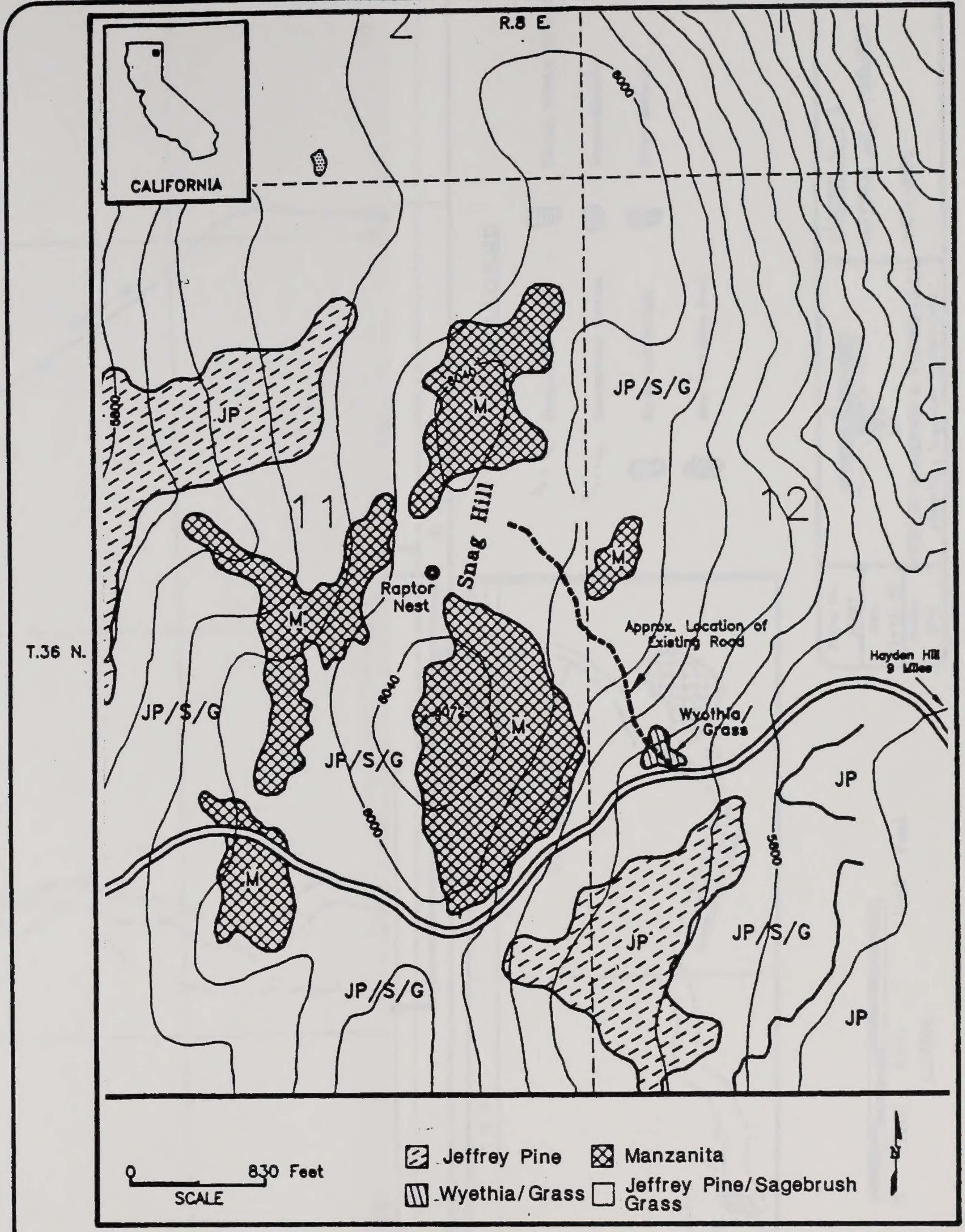
FIGURE 3.4-1
HAYDEN HILL PROJECT
VEGETATION TYPES


R.8 E.
CALIFORNIA
2
1
6000
5800
JP
M
6040
11
12
Snag Hill
Raptor Nest
JP/S/G
T.36 N.
Approx. Location of Existing Road
Hayden Hill 9 Miles
Wyethia/Grass
6072
5800
0
830 Feet
SCALE
▨ Jeffrey Pine
⊠ Manzanita
▥ Wyethia/Grass
☐ Jeffrey Pine/Sagebrush Grass
N

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DATE
1/91

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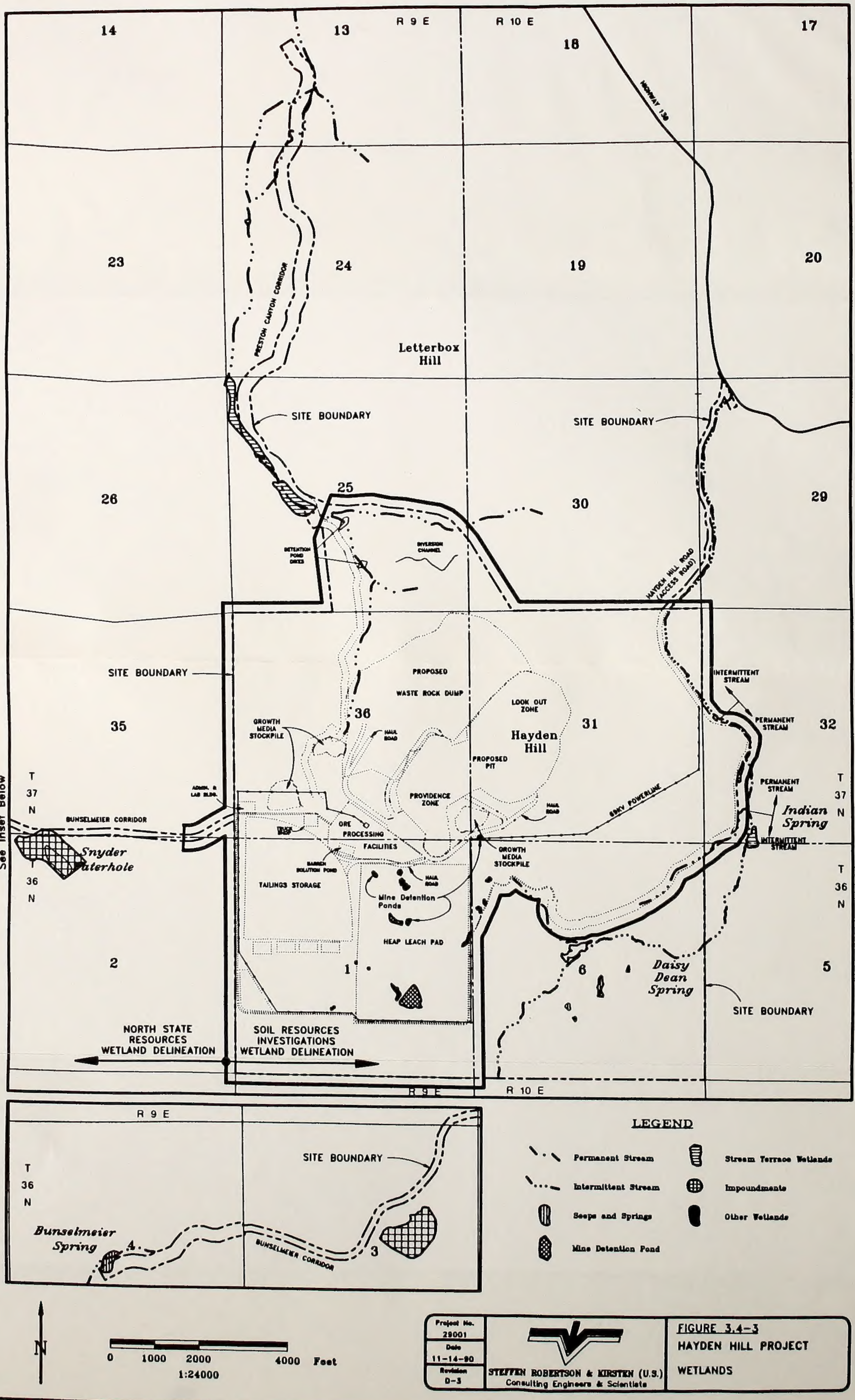
FIGURE 3.4-2

HAYDEN HILL PROJECT
SNAG HILL AREA, CALIFORNIA
SOURCE: BIO-RESOURCES, INC.


14
13
R 9 E
R 10 E
18
17
HIGHWAY 139
23
24
19
20
PRESTON CANYON CORRIDOR
Letterbox Hill
SITE BOUNDARY
SITE BOUNDARY
26
25
30
29
DETENTION POND DIKES
DIVERSION CHANNEL
HAYDEN HILL ROAD (ACCESS ROAD)
SITE BOUNDARY
PROPOSED
WASTE ROCK DUMP
LOOK OUT ZONE
INTERMITTENT STREAM
PERMANENT STREAM
35
36
GROWTH MEDIA STOCKPILE
HAUL ROAD
Hayden Hill
31
32
PROPOSED PIT
PERMANENT STREAM
See Inset Below
T 37 N
ADMIN. & LAB BLDG.
BUNSELMEIER CORRIDOR
PROVIDENCE ZONE
HAUL ROAD
69KV POWERLINE
Indian Spring
T 37 N
Snyder Waterhole
TRUCK SHOP
ORE PROCESSING FACILITIES
INTERMITTENT STREAM
T 36 N
BARREN SOLUTION POND
GROWTH MEDIA STOCKPILE
T 36 N
TAILINGS STORAGE
HAUL ROAD
Mine Detention Ponds
HEAP LEACH PAD
2
1
6
Daisy Dean Spring
5
SITE BOUNDARY
NORTH STATE RESOURCES WETLAND DELINEATION
SOIL RESOURCES INVESTIGATIONS WETLAND DELINEATION
R 9 E
R 10 E
R 9 E
SITE BOUNDARY
T 36 N
Bunselmeier Spring
4
BUNSELMEIER CORRIDOR
3
LEGEND
Permanent Stream
Intermittent Stream
Seeps and Springs
Mine Detention Pond
Stream Terrace Wetlands
Impoundments
Other Wetlands
N
0 1000 2000 4000 Feet
1:24000

Project No.
29001
Date
11-14-90
Revision
0-3

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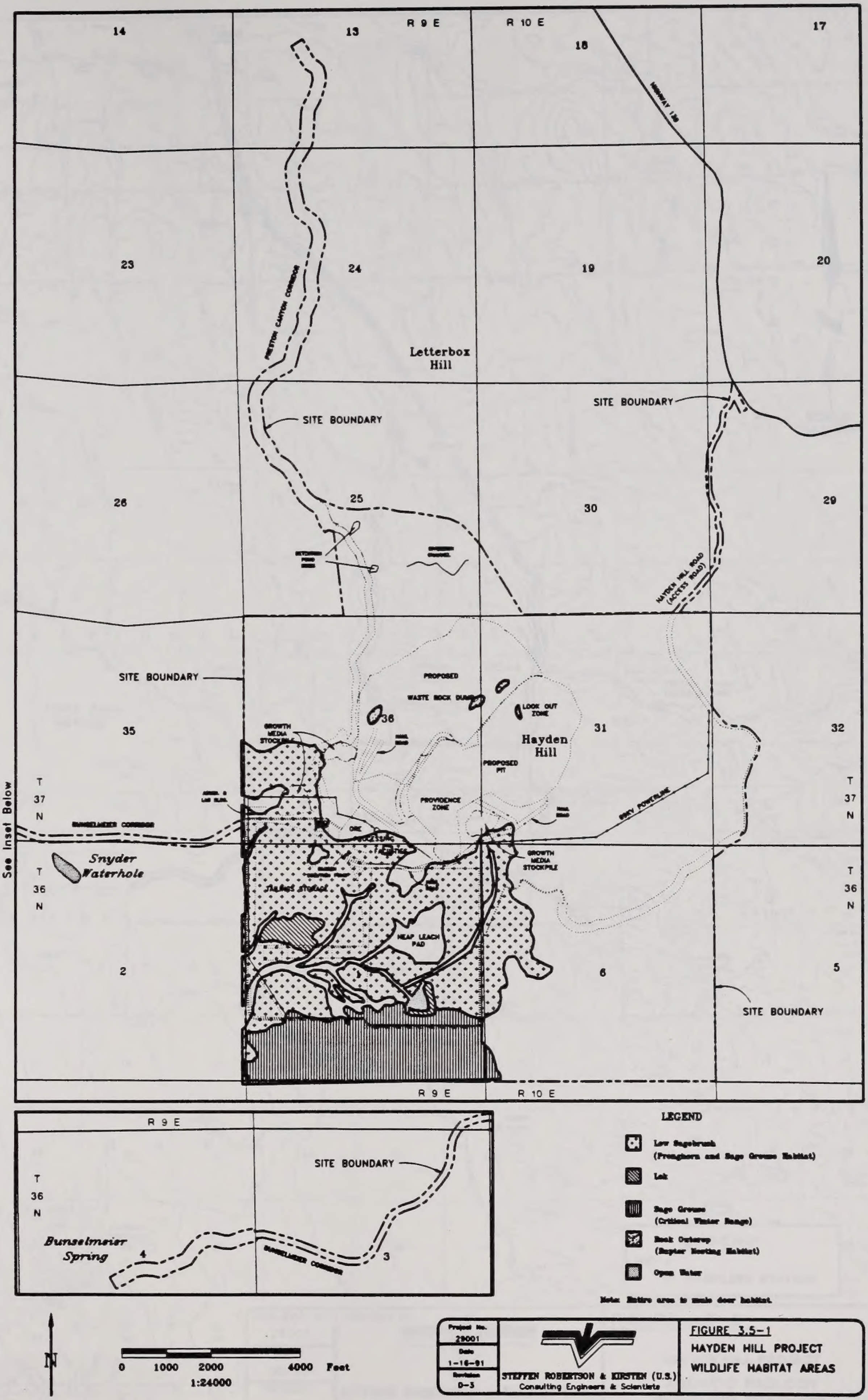
FIGURE 3.4-3
HAYDEN HILL PROJECT
WETLANDS



R 9 E
R 10 E
14
13
18
17
HIGHWAY 139
23
24
19
20
PRESTON CANYON CORRIDOR
Letterbox Hill
SITE BOUNDARY
SITE BOUNDARY
26
25
30
29
HAYDEN HILL ROAD (ACCESS ROAD)
SITE BOUNDARY
35
36
31
32
PROPOSED
WASTE ROCK DUMP
LOOK OUT ZONE
Hayden Hill
GROWTH MEDIA STOCKPILE
PROPOSED PIT
PROVIDENCE ZONE
69KV POWERLINE
See Inset Below
T 37 N
T 37 N
BUNSELMEIER CORRIDOR
ORE PROCESSING FACILITIES
GROWTH MEDIA STOCKPILE
Snyder Waterhole
T 36 N
T 36 N
TAILINGS STORAGE
HEAP LEACH PAD
2
6
5
SITE BOUNDARY
R 9 E
R 10 E
R 9 E
SITE BOUNDARY
T 36 N
Bunselmeier Spring
4
3
BUNSELMEIER CORRIDOR
LEGEND
Low Sagebrush (Pronghorn and Sage Grouse Habitat)
Lek
Sage Grouse (Critical Winter Range)
Rock Outcrop (Raptor Nesting Habitat)
Open Water
Note: Entire area is mule deer habitat.
N
0 1000 2000 4000 Feet
1:24000

Project No.	29001
Date	1-16-91
Revision	0-3

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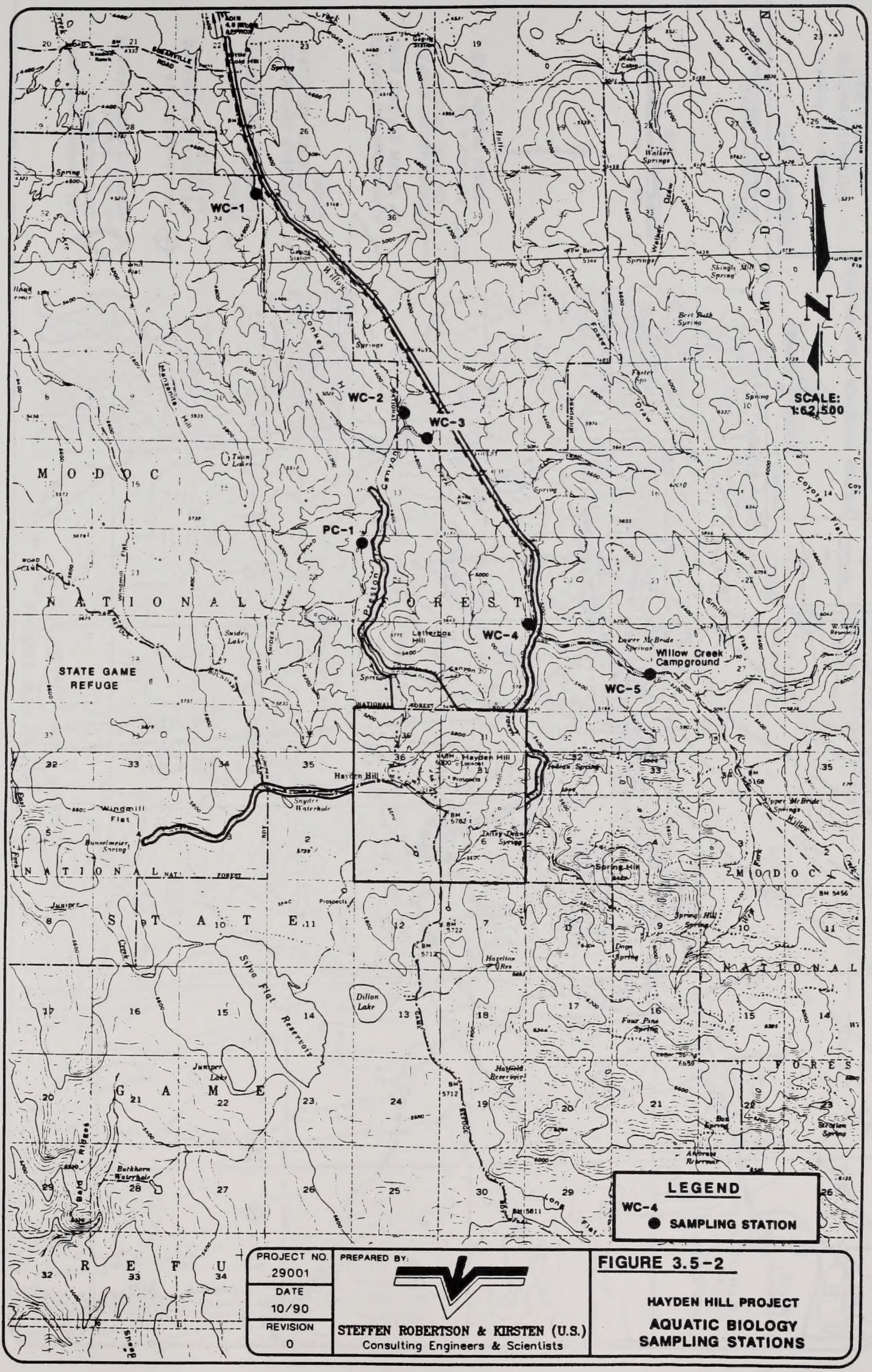
FIGURE 3.5-1
HAYDEN HILL PROJECT
WILDLIFE HABITAT AREAS


WC-1
WC-2
WC-3
PC-1
WC-4
WC-5
Willow Creek Campground
SCALE: 1:62,500
N
M O D O C
N A T I O N A L
F O R E S T
STATE GAME REFUGE
S T A T E
G A M E
R E F U
Hayden Hill
Letterbox Hill
Twin Lake
Snider Lake
Dillon Lake
Juniper Lake
Windmill Flat
Bunnelmeier Spring
Snyder Waterhole
Spring Hill
Walker Springs
Bert Roth Spring
Shingle Mill Spring
Lower McBride Springs
Upper McBride Springs
Four Pane Spring
Hazelton Res
Hatfield Reservoir
Buckhorn Waterhole
Box Spring
Ambrose Reservoir
Stratton Spring
Sitka Flat Reservoir
Preston Canyon
Willow Creek
Coyote Flat

LEGEND

WC-4 ● SAMPLING STATION

PROJECT NO.	29001
DATE	10/90
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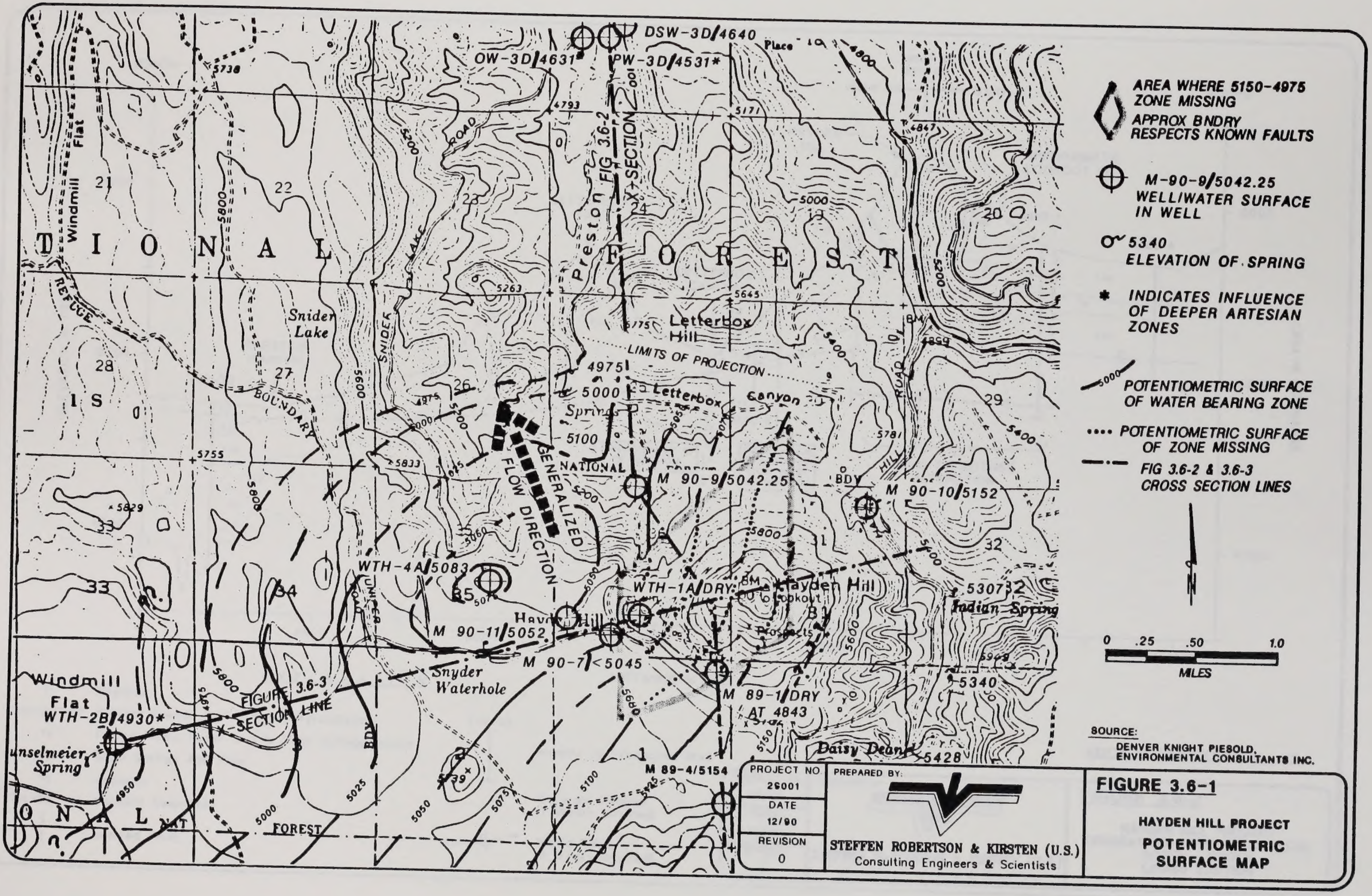
FIGURE 3.5-2

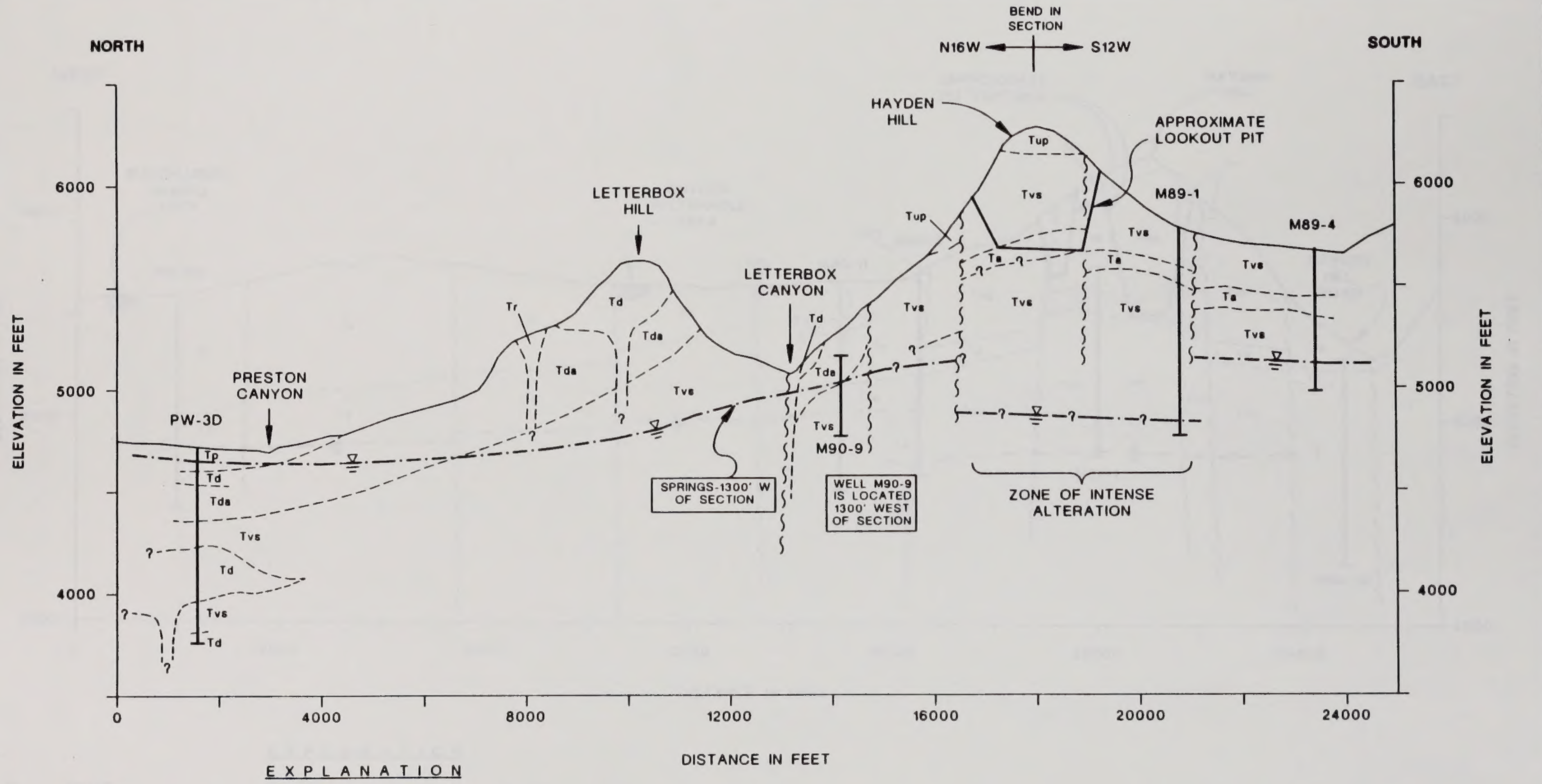
HAYDEN HILL PROJECT

AQUATIC BIOLOGY SAMPLING STATIONS


AREA WHERE 5150-4975 ZONE MISSING
APPROX BNDRY RESPECTS KNOWN FAULTS
M-90-9/5042.25
WELL/WATER SURFACE IN WELL
5340
ELEVATION OF SPRING
* INDICATES INFLUENCE OF DEEPER ARTESIAN ZONES
5000
POTENTIOMETRIC SURFACE OF WATER BEARING ZONE
POTENTIOMETRIC SURFACE OF ZONE MISSING
FIG 3.6-2 & 3.6-3 CROSS SECTION LINES
N
0
.25
.50
1.0
MILES
DSW-3D/4640
OW-3D/4631*
PW-3D/4531*
FIG 3.6-2 X-SECTION
Preston
NATIONAL FOREST
Letterbox Hill
LIMITS OF PROJECTION
4975
5000
5100
Letterbox Canyon
Spring
GENERALIZED FLOW DIRECTION
M 90-9/5042.25
M 90-10/5152
BDY
WTH-4A/5083
WTH-1A/DRY
Hayden Hill
Lookout
Prospects
M 90-11/5052
M 90-7/<5045
M 89-1/DRY AT 4843
M 89-4/5154
5307
Indian Spring
5340
Daisy Dean
5428
Snyder Waterhole
Snider Lake
SNIDER LAKE ROAD
BOUNDARY
REFUGE
Windmill Flat
WTH-2B/4930*
Kunselmeier Spring
FIGURE 3.6-3 X-SECTION LINE
JUNIPER ROAD
HILL ROAD
FOREST
5200
5400
5600
5800
5000
5050
5025
5075
4950
4975

SOURCE:
DENVER KNIGHT PIESOLD,
ENVIRONMENTAL CONSULTANTS INC.

PROJECT NO.	PREPARED BY:	FIGURE 3.6-1
25001	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	HAYDEN HILL PROJECT POTENTIOMETRIC SURFACE MAP
DATE 12/90		
REVISION 0		


BEND IN SECTION
N16W
S12W
NORTH
SOUTH
ELEVATION IN FEET
6000
5000
4000
HAYDEN HILL
APPROXIMATE LOOKOUT PIT
LETTERBOX HILL
LETTERBOX CANYON
PRESTON CANYON
PW-3D
M89-1
M89-4
M90-9
Tup
Tp
Tr
Td
Tda
Tvs
Ta
SPRINGS-1300' W OF SECTION
WELL M90-9 IS LOCATED 1300' WEST OF SECTION
ZONE OF INTENSE ALTERATION
0
4000
8000
12000
16000
20000
24000
DISTANCE IN FEET

EXPLANATION

Tr	Rhyolite
Tup/Tp (Tpct)	Preston Canyon Tuff / Upper Pyroclastic
Td	Dacite Flows, Upper Unit Is Dago Springs Dacite
Tda	Dago Springs Ash Flow
Ta	Andesite
Tvs (Tep/Tib)	Volcanic Sediments
∫	Inferred Fault

PW-3D — Monitor or Production Well

?- - - Geologic Contact (? Where Inferred)

?-·-▽-·- Water Table (? Where Inferred)

VERTICAL EXAGGERATION = 4X

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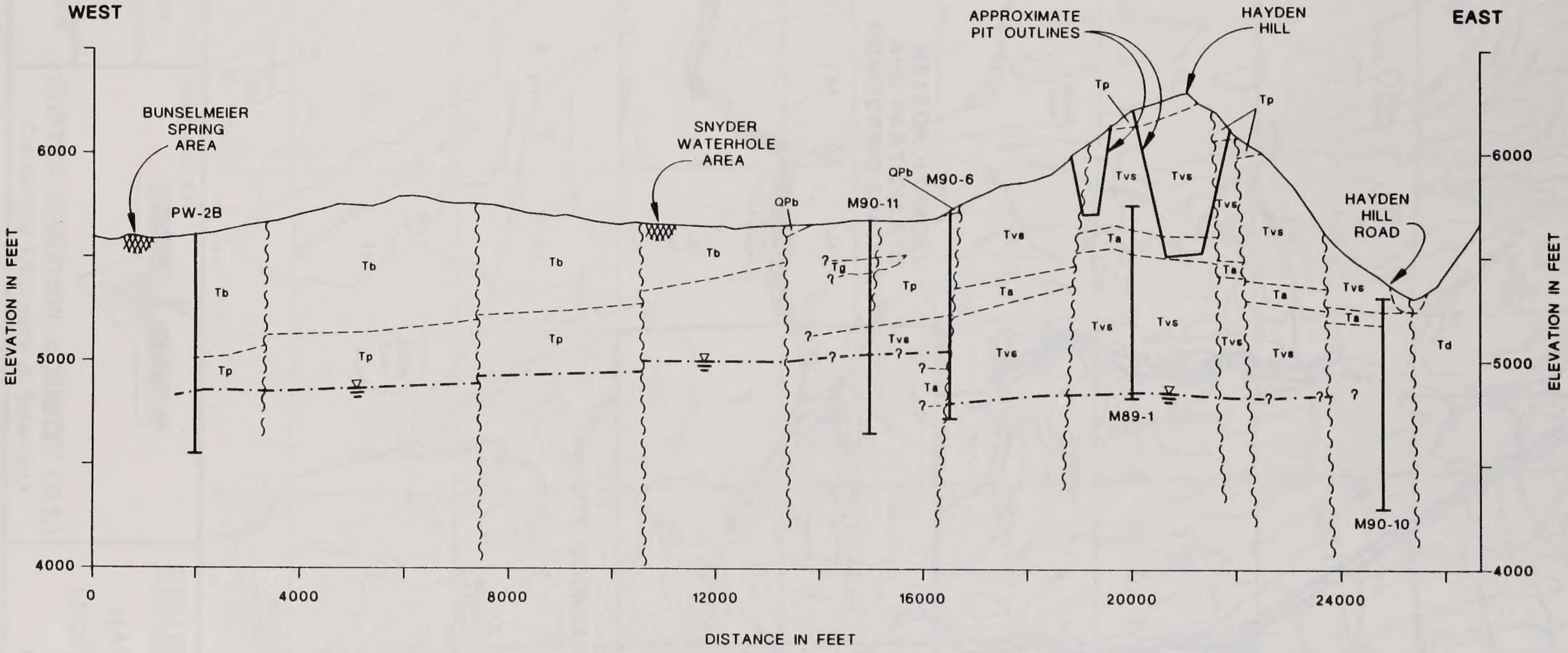
29001	
DATE	
11/90	
REVISION	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists
0	

FIGURE 3.6-2

HAYDEN HILL PROJECT
GENERALIZED HYDROGEOLOGICAL
NORTH - SOUTH
CROSS SECTION


WEST
EAST
ELEVATION IN FEET
6000
5000
4000
0
4000
8000
12000
16000
20000
24000
DISTANCE IN FEET
BUNSELMEIER SPRING AREA
PW-2B
SNYDER WATERHOLE AREA
QPb
M90-11
M90-6
APPROXIMATE PIT OUTLINES
HAYDEN HILL
HAYDEN HILL ROAD
M89-1
M90-10
Tb
Tp
Tg
Tvs
Ta
Td
?

EXPLANATION

Tb	Basalt
Tg	Gravels
Tp (Tpct)	Preston Canyon Tuff / Upper Pyroclastic
Td	Dago Springs Ash Flow
Ta	Andesite
Tvs (Tep/Tib)	Volcanic Sediments
∫	Inferred Fault

PW-2B

Monitor or Production Well

Geologic Contact (? Where Inferred)

Water Table (? Where Inferred)

VERTICAL EXAGGERATION = 4X

PROJECT NO.	29001
DATE	11/90
REVISION	0

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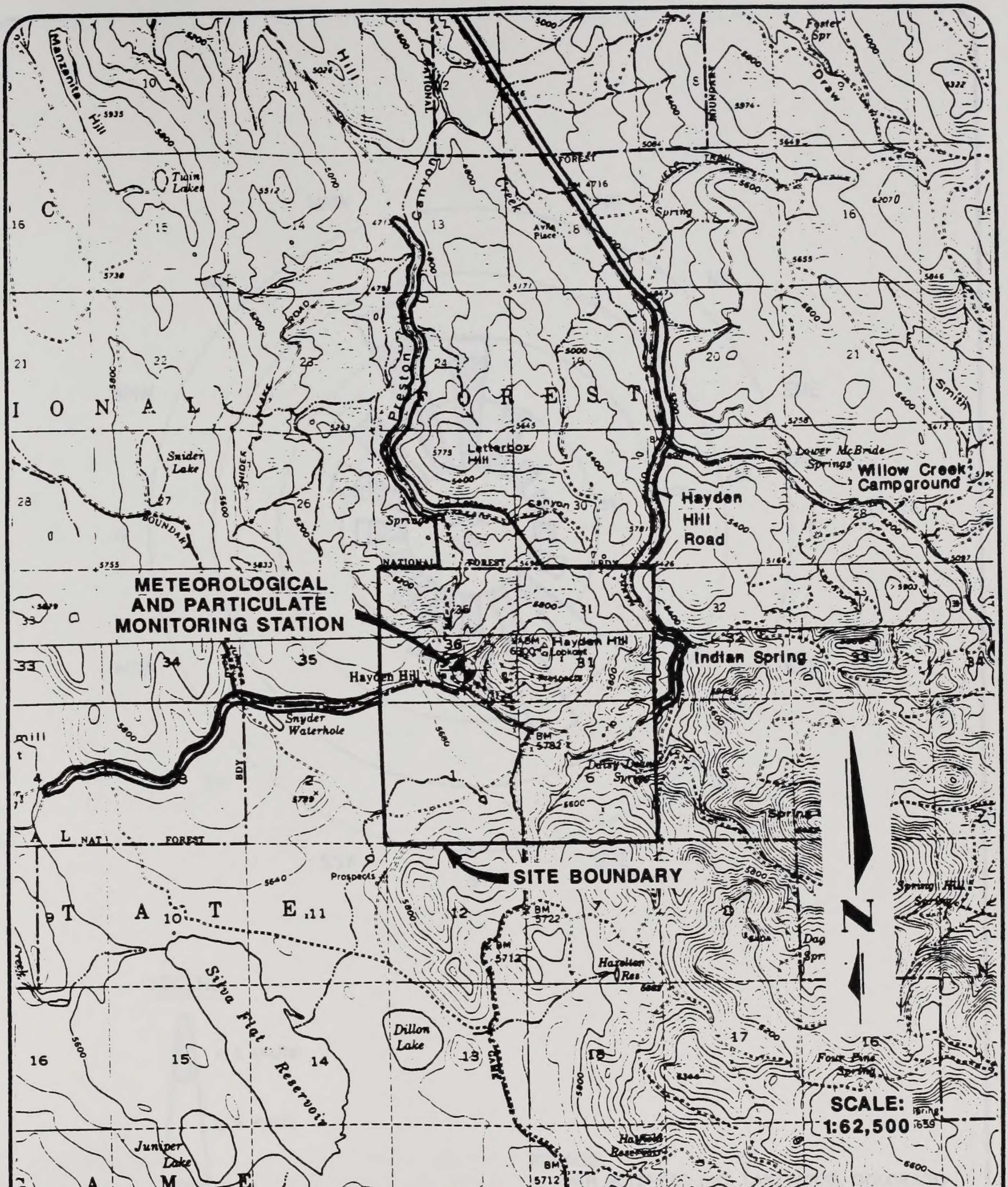
FIGURE 3.6-3

HAYDEN HILL PROJECT
GENERALIZED HYDROGEOLOGICAL
WEST - EAST (N 75 E)
CROSS SECTION


METEOROLOGICAL AND PARTICULATE MONITORING STATION
SITE BOUNDARY
Hayden Hill Road
Hayden Hill
Indian Spring
Willow Creek Campground
Lower McBride Springs
Letterbox Hill
Preston Canyon
Snyder Waterhole
Snider Lake
Twin Lakes
Manzanita Hill
Silva Flat Reservoir
Dillon Lake
Juniper Lake
Hazelton Res
Daisy Lane Spring
Four Pine Spring
Spring Hill Spring
Prospects
NATIONAL FOREST
STATE GAME
N
SCALE: 1:62,500

PROJECT NO.
29001

DATE
1/91

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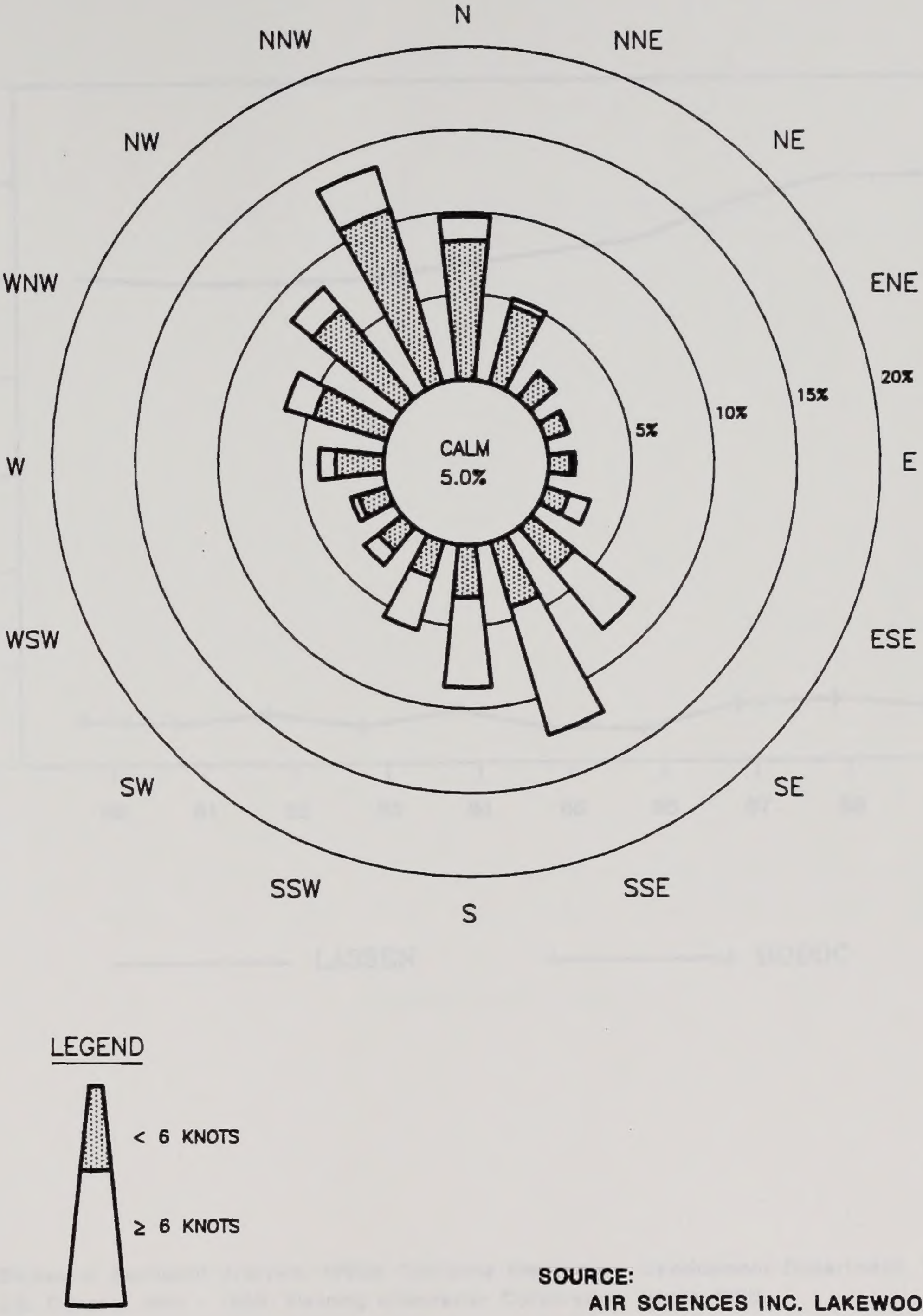
FIGURE 3.7-1

HAYDEN HILL PROJECT

LOCATION OF METEOROLOGICAL AND PARTICULATE MONITORING STATION



SOURCE:
AIR SCIENCES INC. LAKEWOOD, COLORADO

PROJECT NO.
29001

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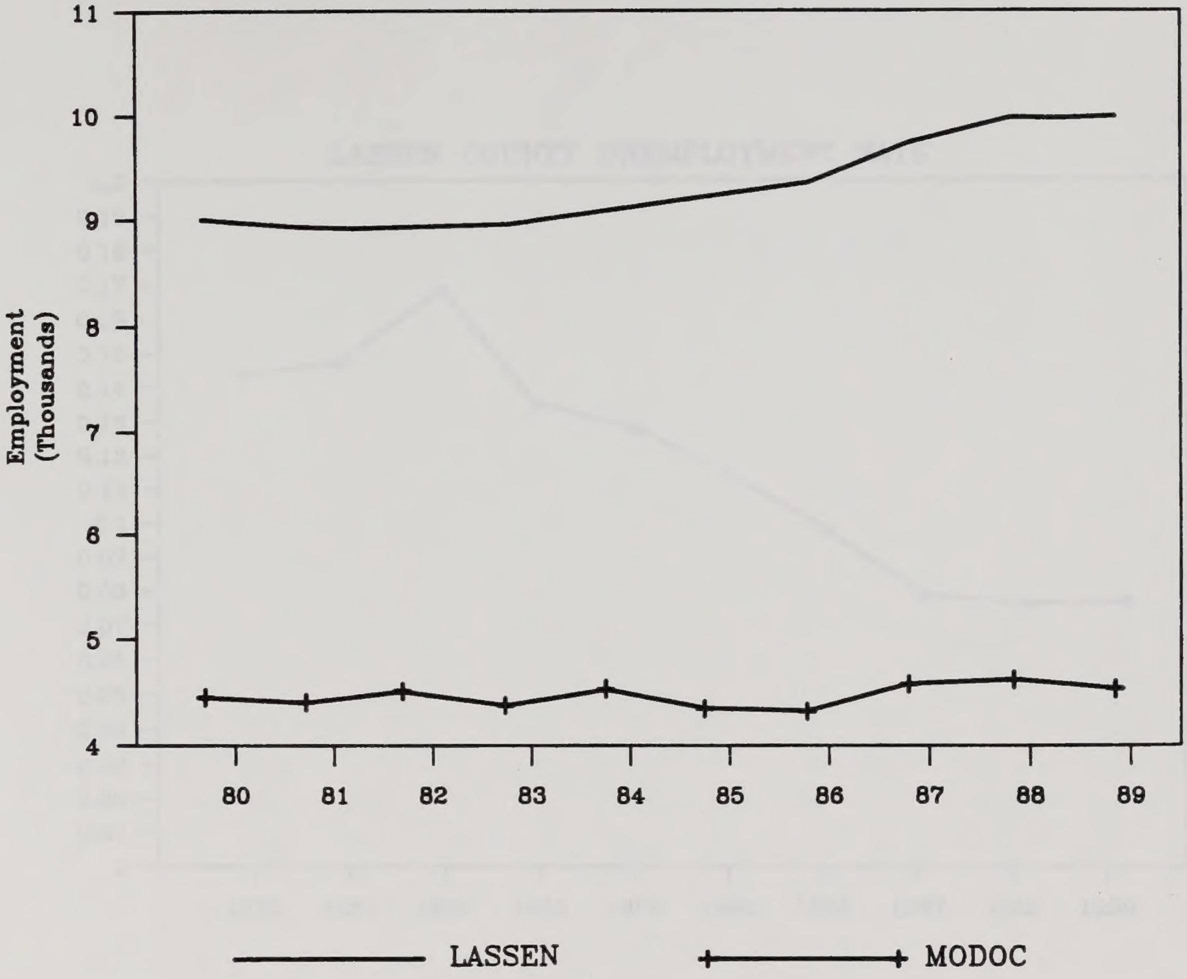
FIGURE 3.7-2

HAYDEN HILL PROJECT
WIND FREQUENCY DISTRIBUTION



Source: Bureau of Economic Analysis, 1990b. California Employment Development Department, 1989c & d. U.S. Census, 1985 - 1989. Planning Information Corporation, March 1990.

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1/91		
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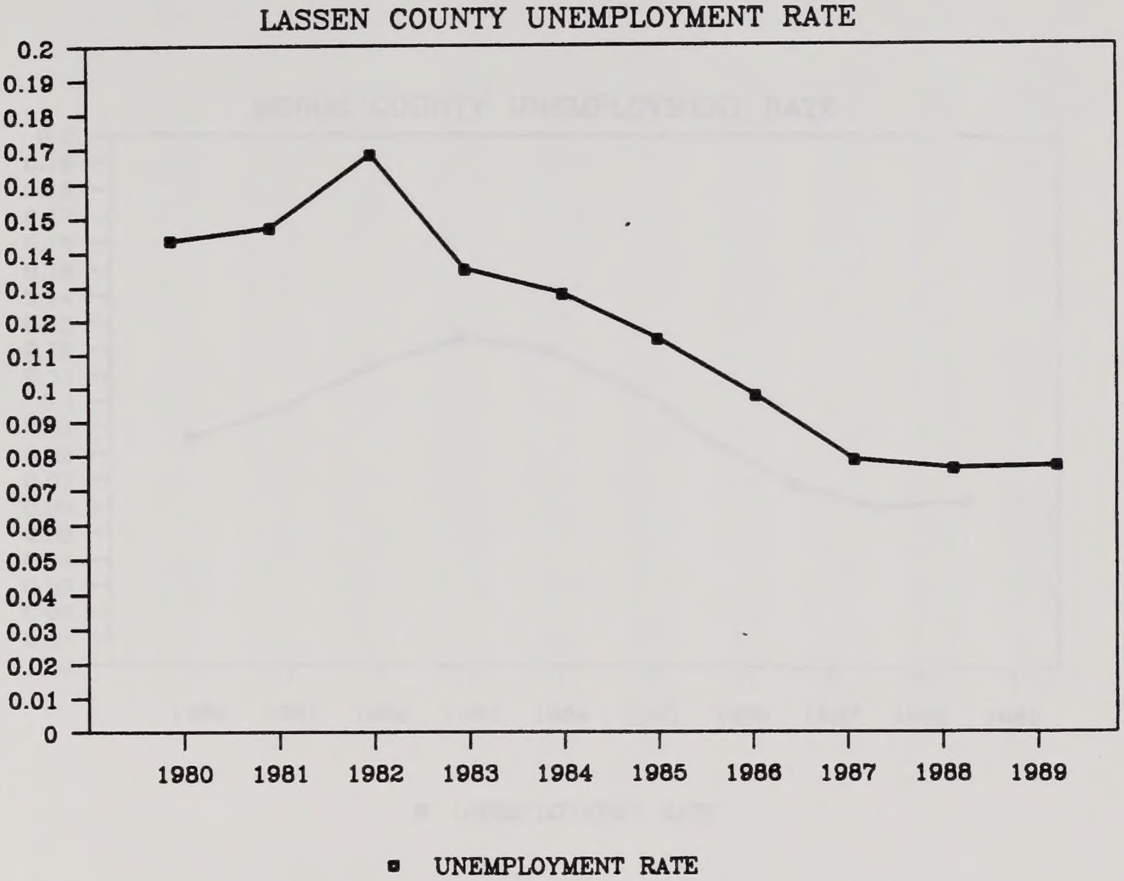
0		

FIGURE 3.8-1

HAYDEN HILL PROJECT

EMPLOYMENT BY PLACE OF WORK
LASSEN & MODOC COUNTIES



Source: California Employment Development Department, 1989a.
Planning Information Corporation, March 1990.

PROJECT NO.
29001
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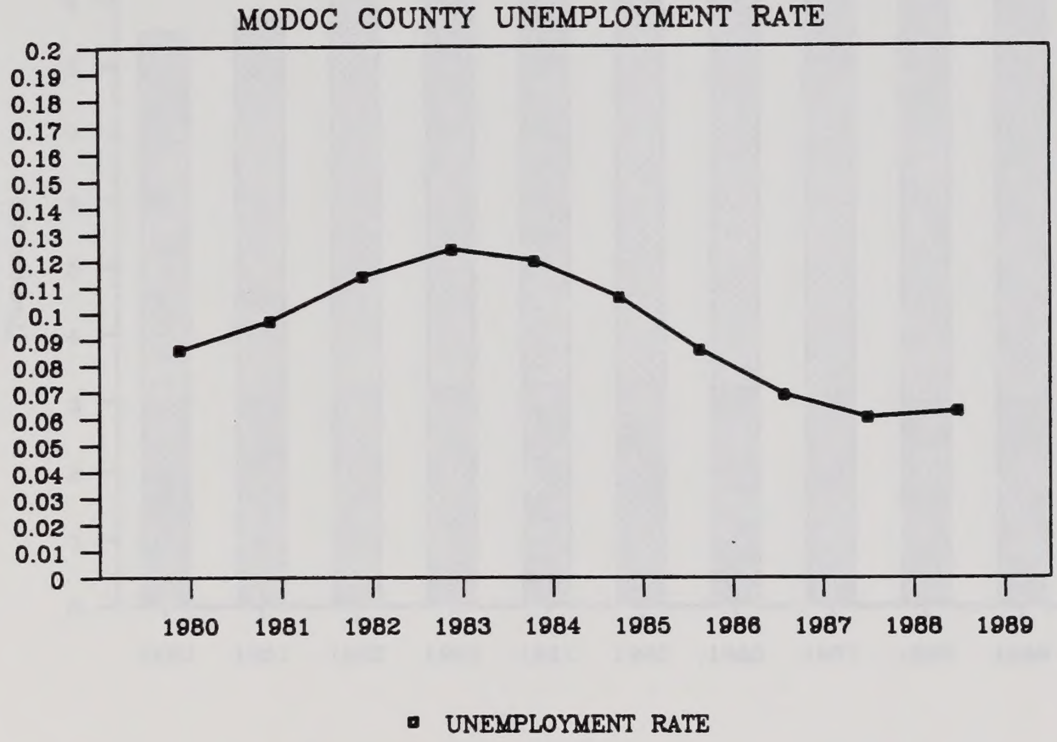
FIGURE 3.8-2

HAYDEN HILL PROJECT
LASSEN COUNTY
UNEMPLOYMENT RATE



Source: California Employment Development Department, 1989c.
Planning Information Corporation, March 1990.

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29001
DATE
1/91
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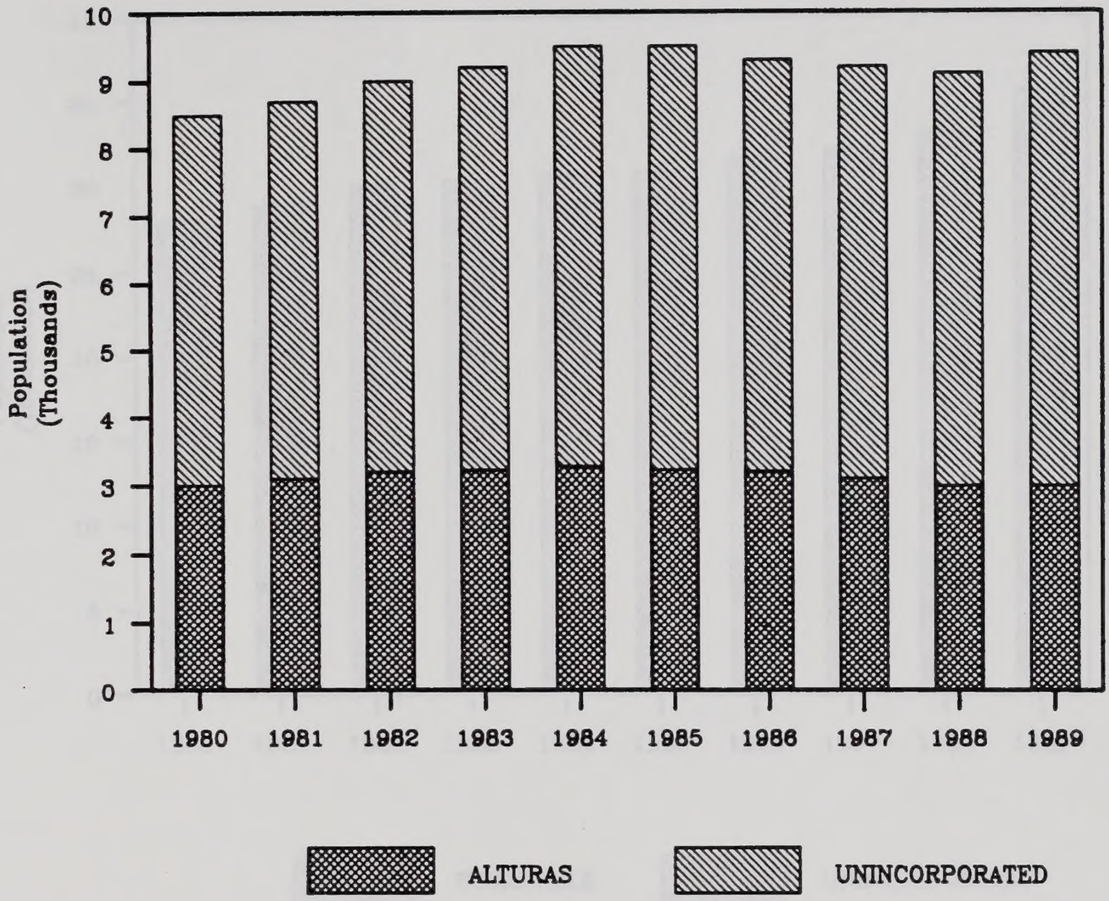
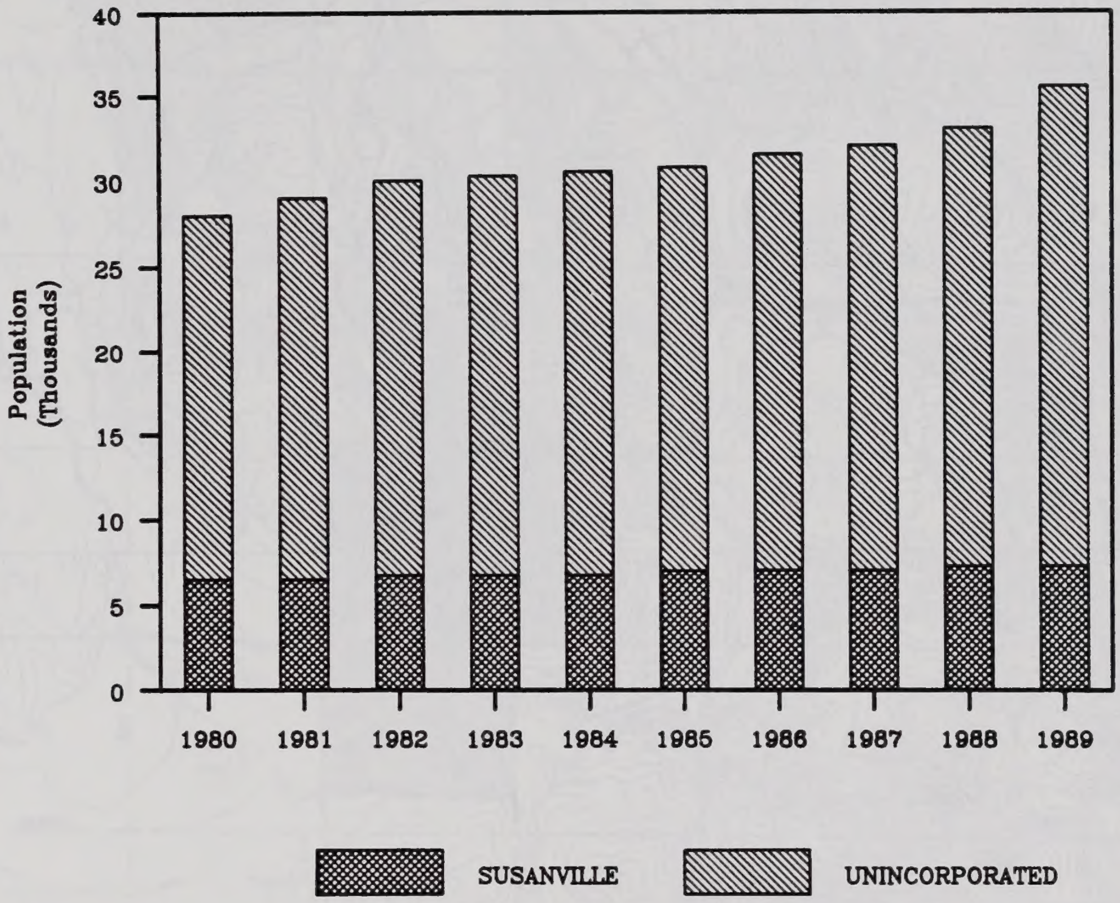
FIGURE 3.8-3

HAYDEN HILL PROJECT
MODOC COUNTY UNEMPLOYMENT RATE



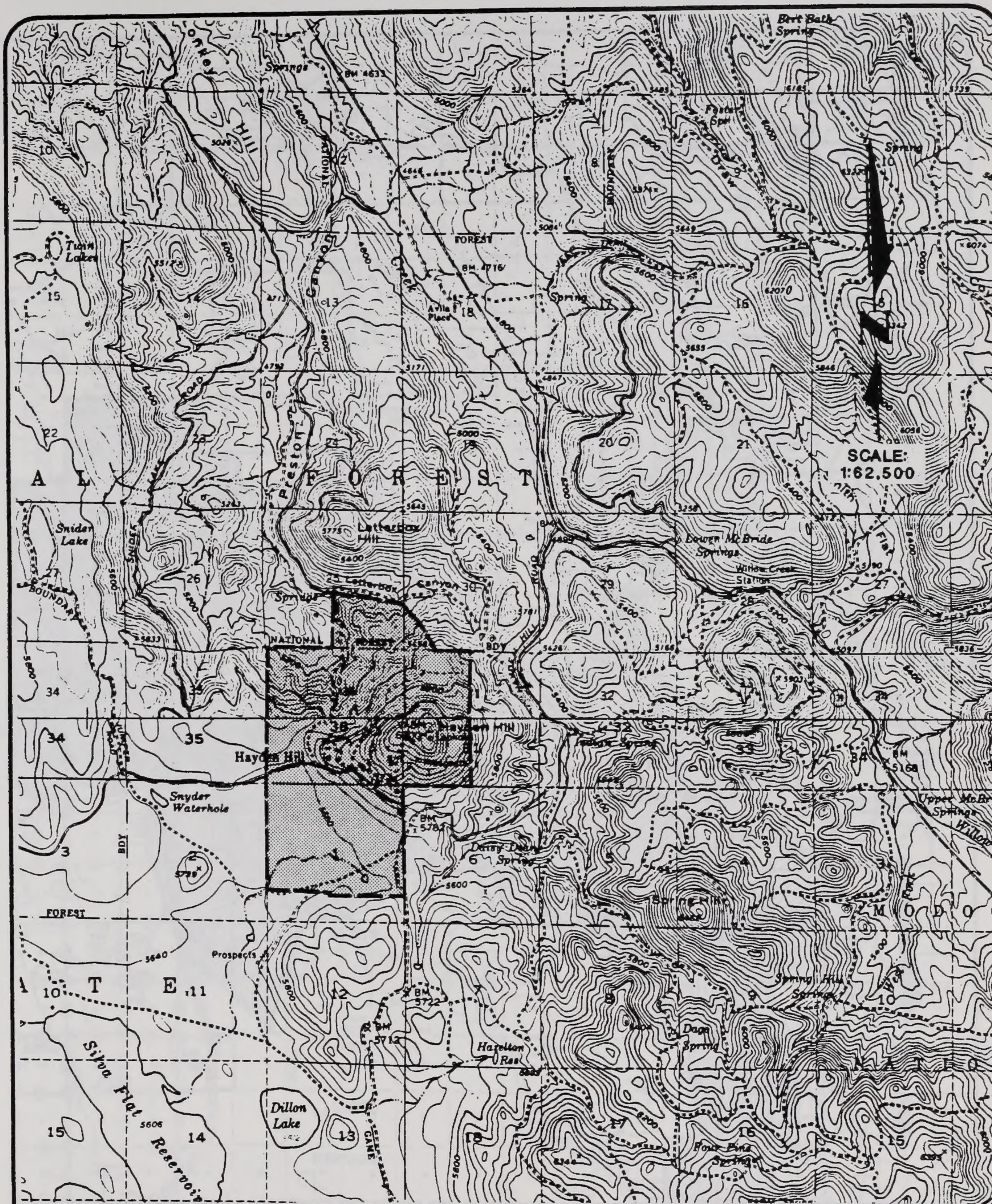
Source: California Department of Finance: Demographic Research Unit, U.S. Census, Planning Information Corporation, March 1990.

PROJECT NO. 29001	PREPARED BY: **STEFFEN ROBERTSON & KIRSTEN (U.S.)** Consulting Engineers & Scientists	**FIGURE 3.8-4** **HAYDEN HILL PROJECT** **MODOC COUNTY POPULATION**
DATE 1/91		
REVISION 0		



Source: California Department of Finance: Demographic Research Unit, U.S. Census, Planning Information Corporation, March 1990.

PROJECT NO. 29001	PREPARED BY:	**FIGURE 3.8-5**
DATE 1/91		HAYDEN HILL PROJECT
REVISION 0	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	LASSEN COUNTY POPULATION


SCALE:
1:62,500
Bert Bath Spring
Springs
BM 4633
Foster Spr
Spring
Tionn Lake
FOREST
BM 4716
Avila Place
Canyon
Creek
Preston
Spring
A L
F O R E S T
Snider Lake
Letterbox Hill
Lower McBride Springs
Willow Creek Station
Letterbox Canyon
Springs
NATIONAL
BDY
Hayden Hill
Hayden Hill
Snyder Waterhole
BM 5782
Daisy Dean Spring
Spring Hill
Upper McBride Springs
FOREST
Prospects
A T E
BM 5722
BM 5712
Spring Hill Springs
Dago Spring
Hazelton Res
Dillon Lake
Silva Flat Reservoir
GAME
Four Pine Springs
M O D O C
N A T I O

PROJECT NO.
29001

DATE
12/90

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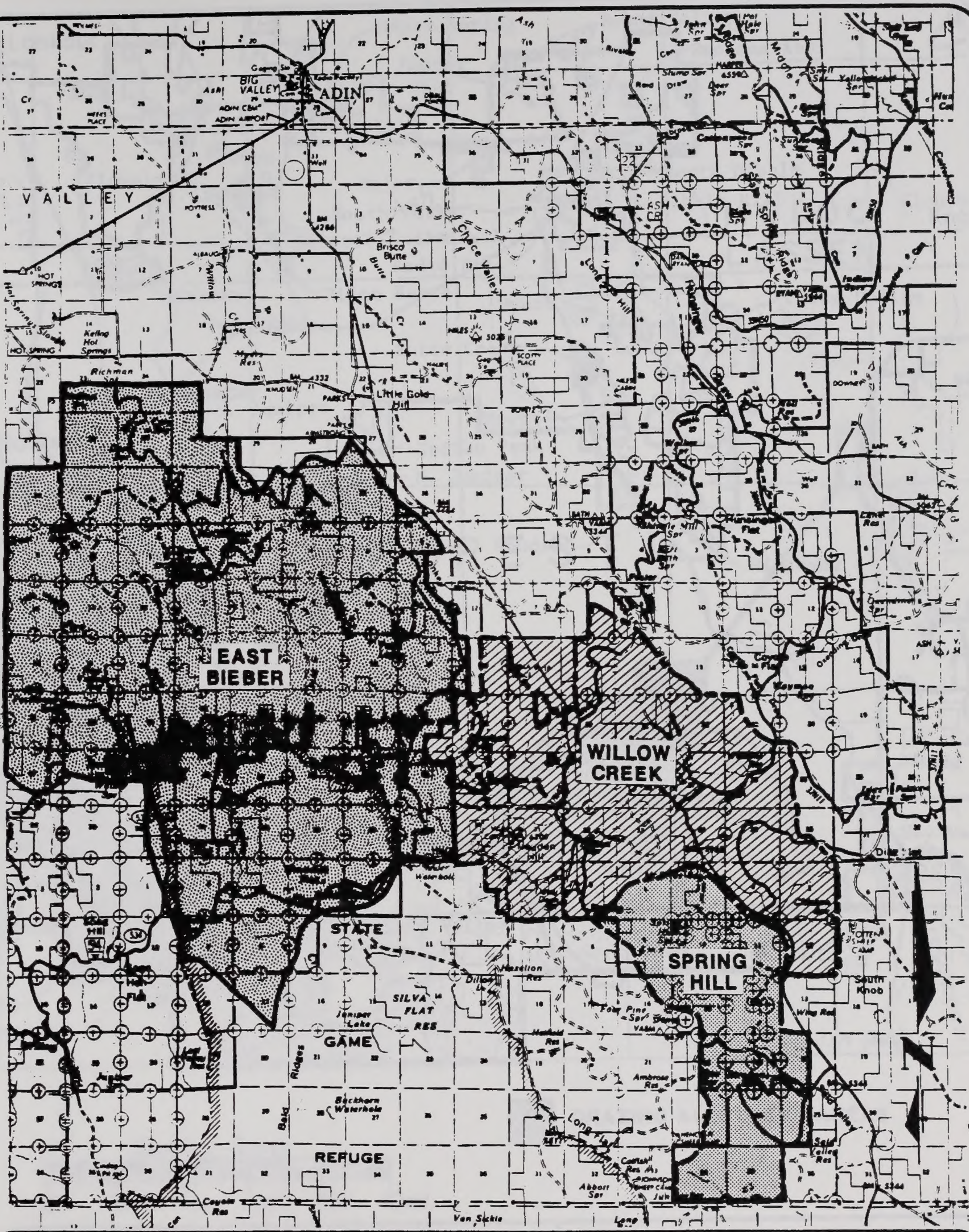
FIGURE 3.9-1

HAYDEN HILL PROJECT
LAND USE
MINE SITE BLOCK


ADIN
BIG VALLEY
ADIN AIRPORT
V A L L E Y
HOT SPRINGS
Kellog Hot Springs
Richman
Brisco Butte
Chace Valley
Little Gold Hill
Long Valley
Huntinger Flat
Indian Spr
EAST BIEBER
WILLOW CREEK
SPRING HILL
STATE
GAME
REFUGE
SILVA FLAT RES
Juniper Lake
Bald Ridges
Buckhorn Waterhole
Hazelton Res
Dillon Lk
Four Pine Spr
Ambrose Res
Long Flat
Abbott Spr
South Knob
Sand Valley Res
Coyote Res
Van Sickle
N

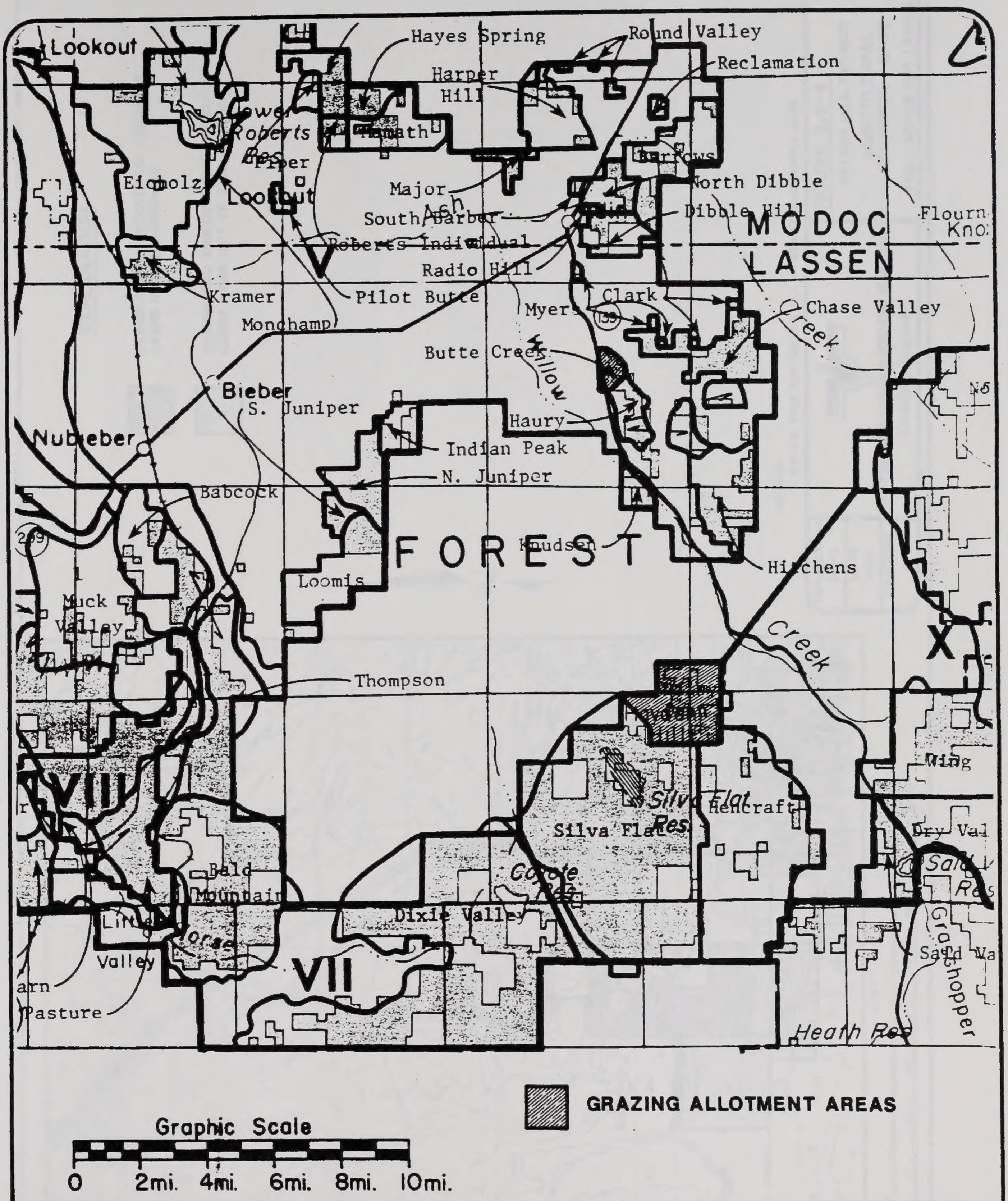
PROJECT NO.	PREPARED BY:
29001	
DATE	
11/90	
REVISION	STEFFEN ROBERTSON & KIRSTEN (U.S.)
0	Consulting Engineers & Scientists

FIGURE 3.9-2

HAYDEN HILL PROJECT

USFS GRAZING MANAGEMENT UNITS

SOURCE: U.S.D.A./U.S.F.S.
MODOC NATIONAL FOREST, CALIFORNIA


Lookout
Hayes Spring
Round Valley
Reclamation
Harper Hill
Lower Roberts Res.
Klamath
Piper
Eicholz
Lookout
Major
Ash
South Barber
Roberts Individual
Radio Hill
Barrows
North Dibble
Dibble Hill
MODOC
LASSEN
Flourn
Kno
V
Kramer
Pilot Butte
Monchamp
Myers
Clark
Chase Valley
Creek
Butte Creek
Willow
Bieber
S. Juniper
Nubieber
Haury
Indian Peak
N. Juniper
Babcock
299
Muck Valley
FOREST
Knudsen
Hitchens
Loomis
Creek
X
Thompson
Hayden Hill
Wing
VIII
Silva Flat Res.
Hencraft
Silva Flat
Dry Val
Bald Mountain
Coyote Res.
Sand Res
Dixie Valley
Little Valley
Horse
VII
Sand Va
Grasshopper
Barn Pasture
Heath Res
139
GRAZING ALLOTMENT AREAS
Graphic Scale
0
2mi.
4mi.
6mi.
8mi.
10mi.

PROJECT NO.
29001

DATE
11/90

REVISION
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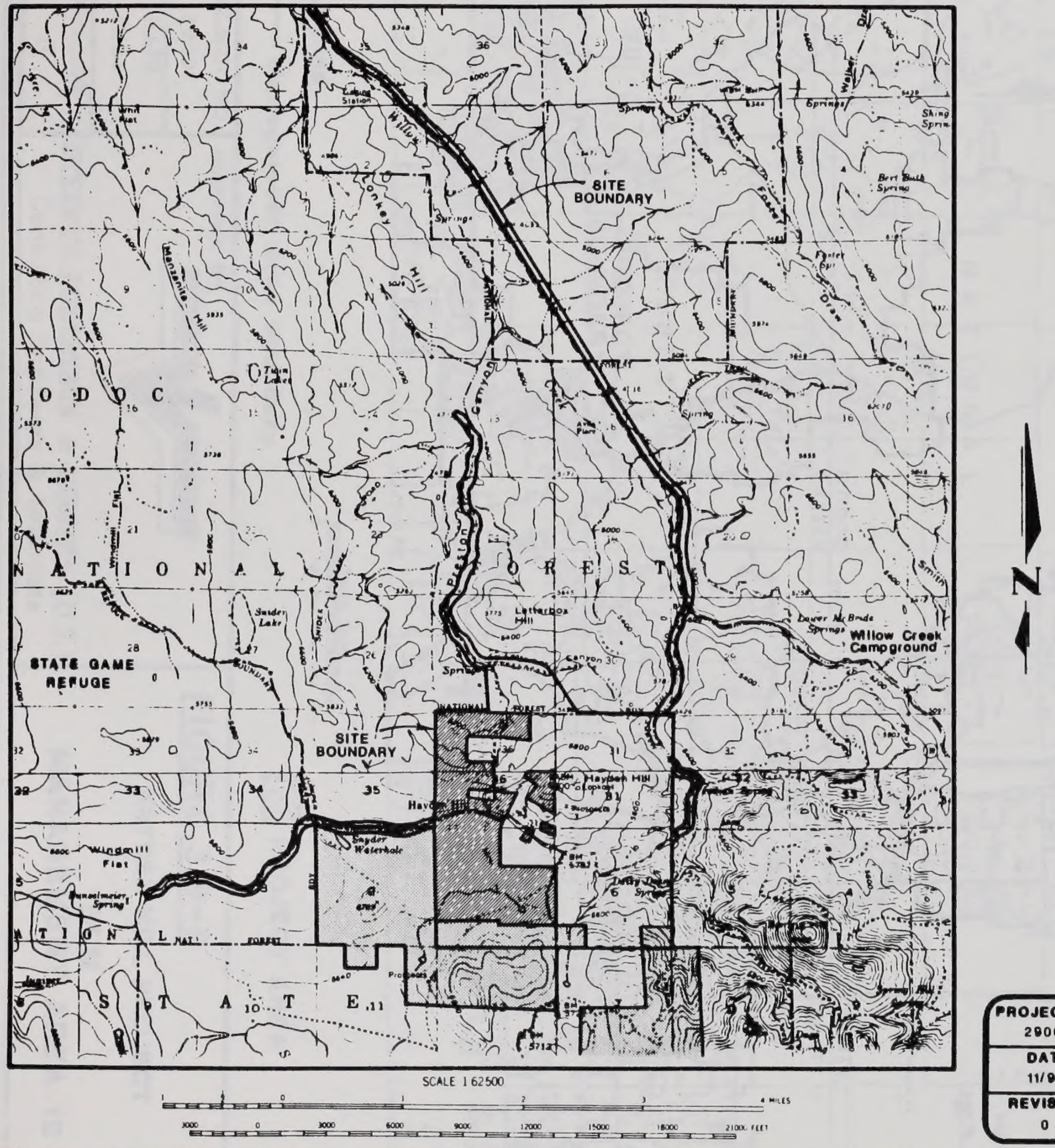
FIGURE 3.9-3

HAYDEN HILL PROJECT

BLM GRAZING ALLOTMENTS


SITE BOUNDARY
SITE BOUNDARY
Willow Creek Campground
Lower McBride Springs
Letterbox Hill
Hayden Hill
Snyder Waterhole
Windmill Flat
STATE GAME REFUGE
Snider Lake
Twin Lakes
Manzanita Hill
Conkey Hill
Willow
Preston Canyon
Lookout Station
Bert Smith Spring
Foster Draw
Springs
Spring
Dewey Spring
Buchanan Spring
Prospects
M O D O C
N A T I O N A L
F O R E S T
N A T I O N A L
S T A T E
NATIONAL FOREST
N
SCALE 1:62500
4 MILES
21000 FEET

EXPLANATION

▨ DESIGNATED AGRICULTURAL PRESERVE LANDS IN SITE BOUNDARY

░ DESIGNATED AGRICULTURAL PRESERVE LANDS ADJACENT TO SITE BOUNDARY

SOURCE:
U.S.G.S. ADIN AND HAYDEN HILL 15 MINUTE QUADRANGLE MAPS.

PROJECT No. 29001
DATE 11/90
REVISION 0

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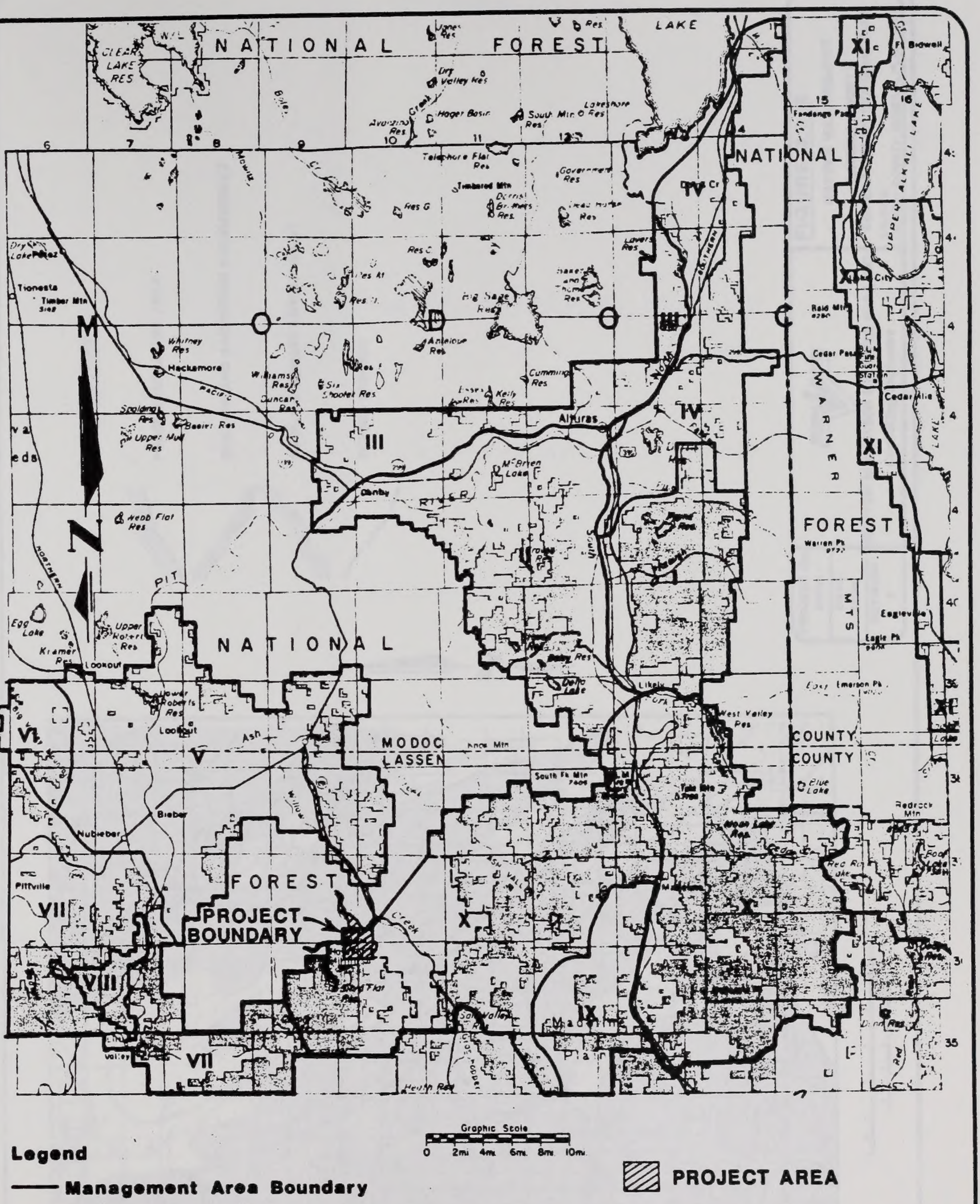
Consulting Engineers

FIGURE 3.9-4
HAYDEN HILL PROJECT
AGRICULTURAL PRESERVE LANDS
(WILLIAMSON ACT LANDS)


NATIONAL FOREST
LAKE
Clear Lake Res
Dry Valley Res
Hager Basin
South Mtn Res
Lakeshore Res
Telephone Flat Res
Government Res
NATIONAL
XI
Ft Bidwell
Fandango Pass
UPPER ALKALI LAKE
Lake City
Tionesta
Timber Mtn
M
O
D
O
C
Whitney Res
Hackamore
Pacific
Big Sage Res
Antelope Res
Williams Res
Six Shooter Res
Duncan Res
Cumming Res
Cedar Pass
Cedarville
Spalding Res
Upper Mud Res
III
IV
Alturas
Canby
RIVER
McBrien Lake
W A R N E R
Webb Flat Res
N
PIT
FOREST
Warren Pk
MTS
Eagleville
Eagle Pk
Egg Lake
Kramer Res
Upper Roberts Res
Lookout
NATIONAL
Lower Roberts Res
Likely
Emerson Pk
West Valley Res
VI
V
Ash
MODOC
LASSEN
COUNTY
COUNTY
South Fk Mtn
Blue Lake
Redrock Mtn
Bieber
Nubieber
Pittville
VII
FOREST
PROJECT BOUNDARY
Creek
X
VIII
IX
Madeline
Plain
VII
Heath Res
Dodge Res
Graphic Scale
0
2mi
4mi
6mi
8mi
10mi
Legend
Management Area Boundary
PROJECT AREA

PROJECT NO.
29001
DATE
11/90
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0

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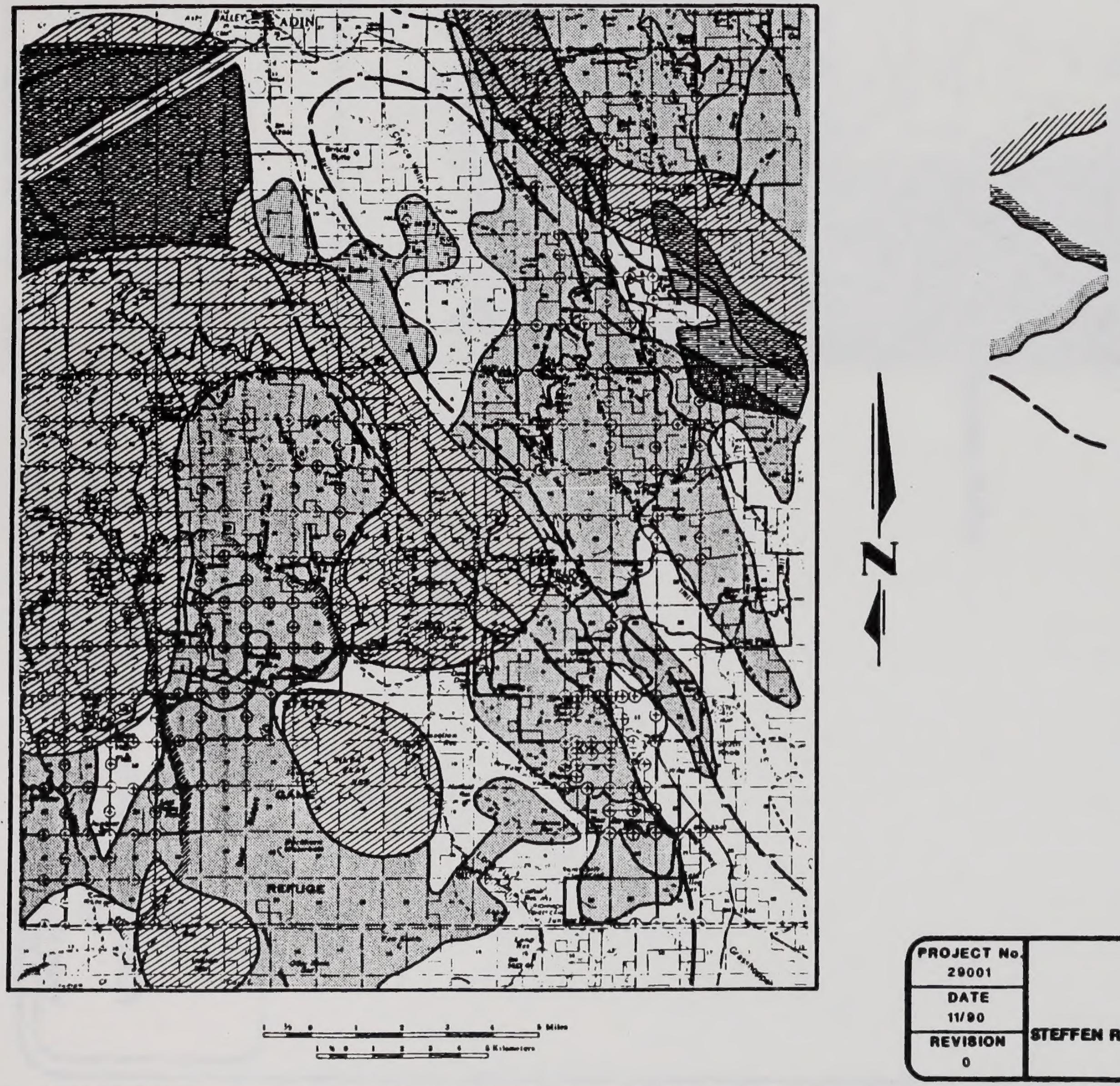
FIGURE 3.9-5

HAYDEN HILL PROJECT

BLM
MANAGEMENT AREA 10



ADIN
REFUGE
GAME
N
Miles
Kilometers
EXPLANATION
PRIME RECREATION AREA
GRAZING AND SAGEBRUSH ENVIRONMENT
GENERAL FOREST ENVIRONMENT
SCENIC HIGHWAY

PROJECT No.
29001
DATE
11/90
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0

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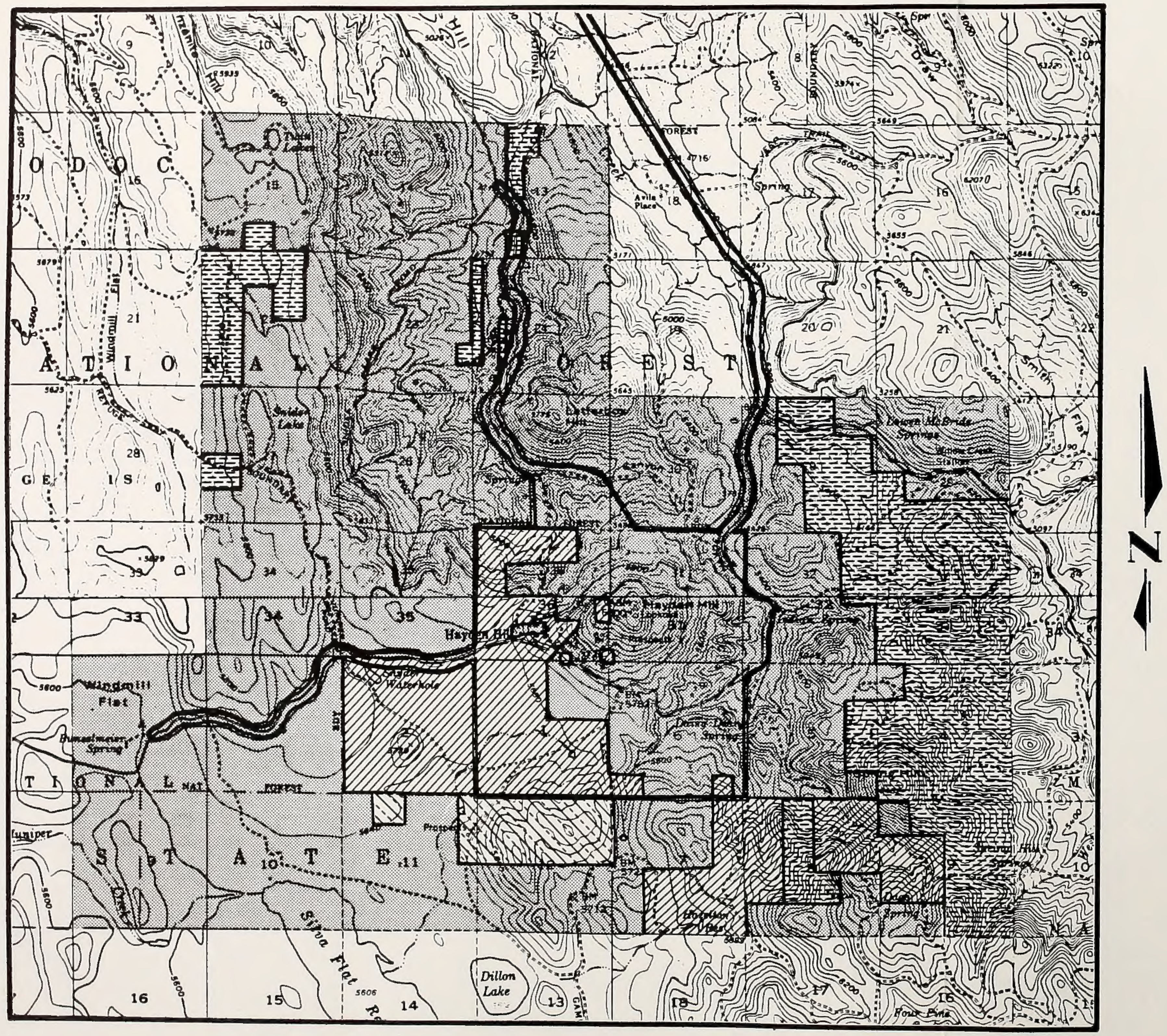
FIGURE 3.9-6
HAYDEN HILL PROJECT
LASSEN COUNTY
GENERAL PLAN DESIGNATIONS
SOURCE:
LASSEN COUNTY GENERAL PLAN, 1968


MODOC
NATIONAL FOREST
NATIONAL FOREST
STATE
Hayden Hill
Windmill Flat
Dillon Lake
Four Pine
Spring
N

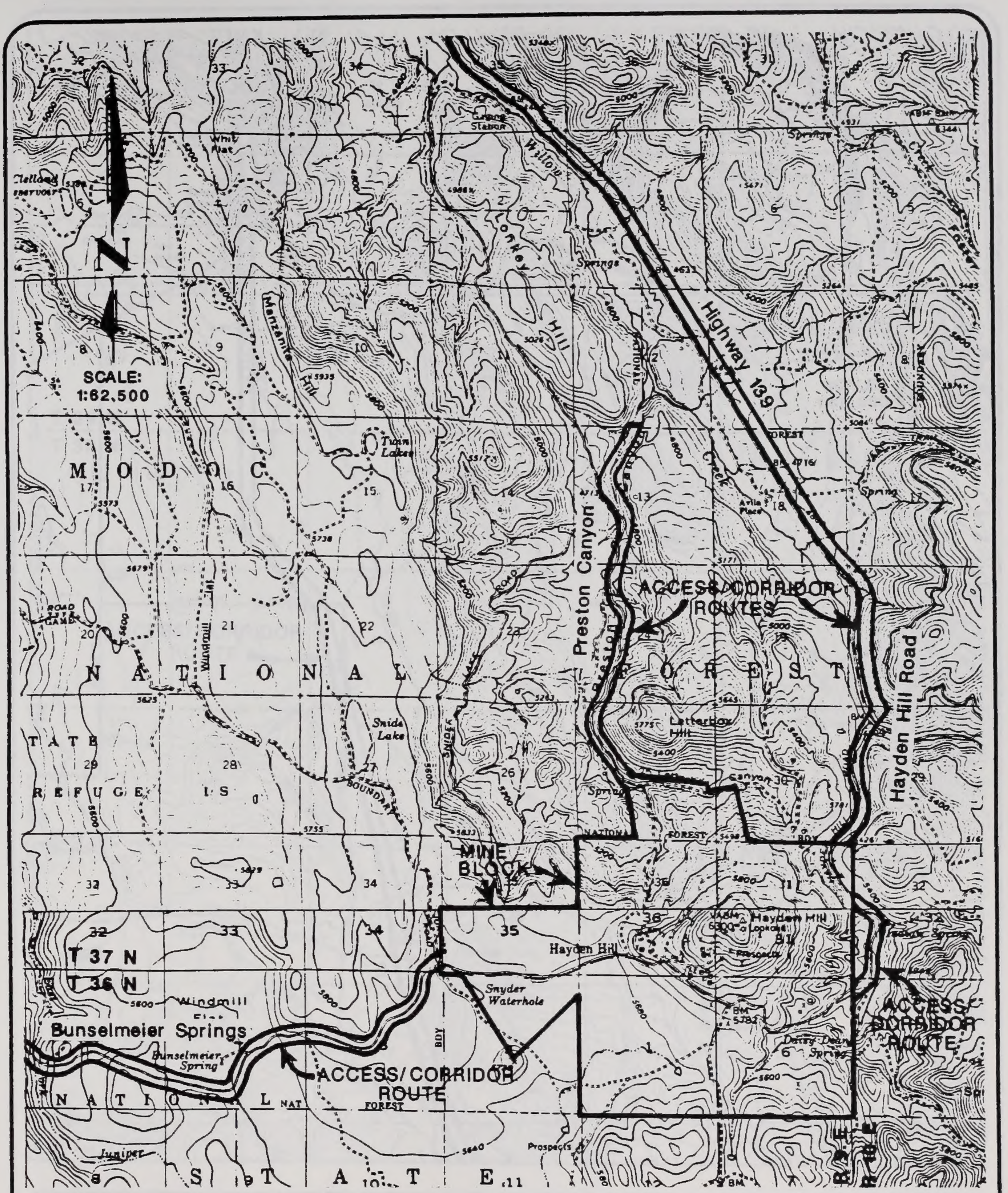
LEGEND

▨ UC	UPLAND CONSERVATION
▨ UCAP	UPLAND CONSERVATION AGRICULTURAL PRESERVE
▨ UC2	UPLAND CONSERVATION RESOURCE MANAGEMENT
▤ TP2	TIMBER PROTECTION ZONE
▬	SITE BOUNDARY

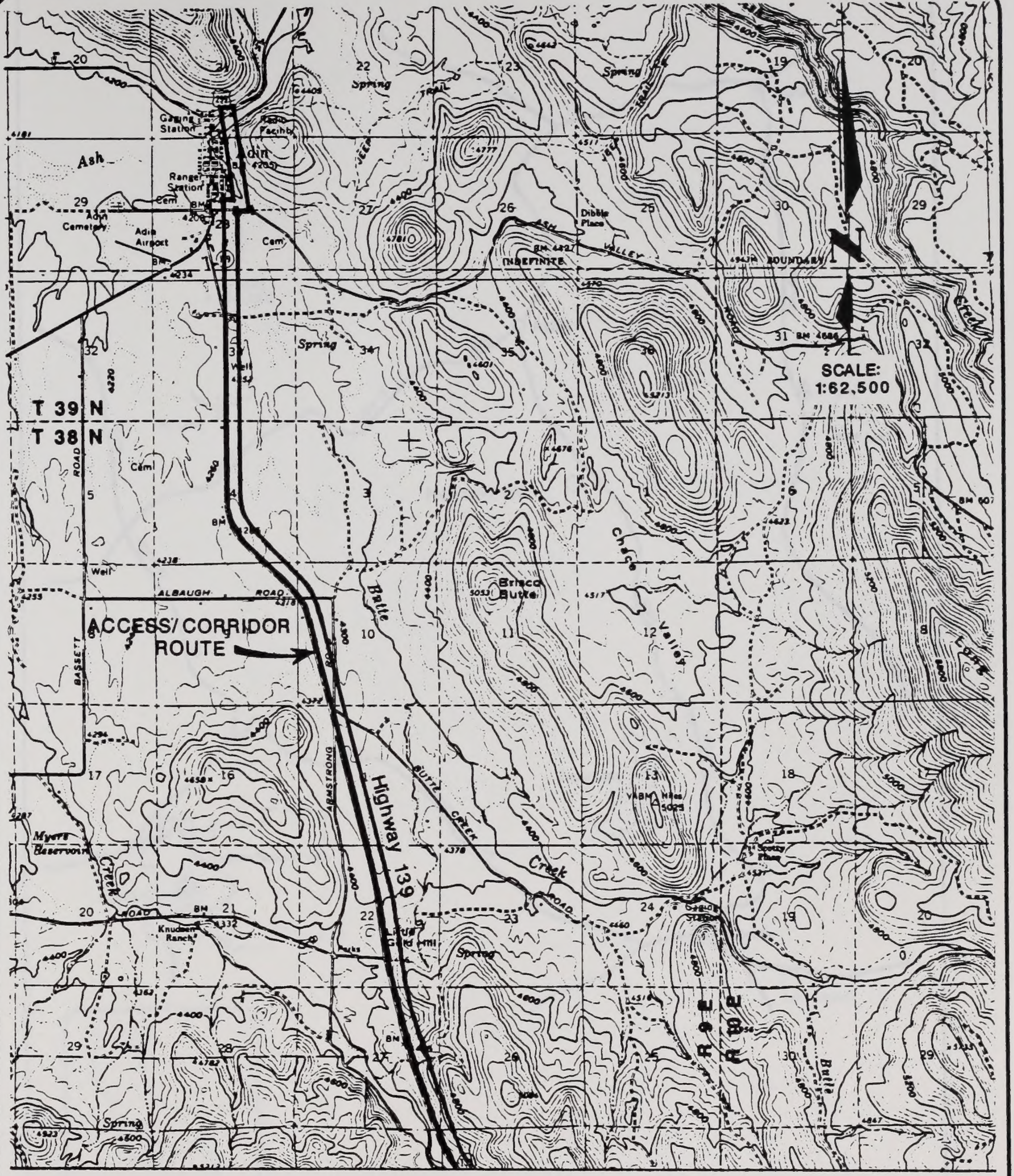
SCALE 1:62500

1 ½ 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

PROJECT NO. 29001	PREPARED BY:	**FIGURE 3.9-7**
DATE 11/90	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	HAYDEN HILL PROJECT COUNTY ZONING DISTRICT CLASSIFICATIONS
REVISION 0		FROM: LASSEN COUNTY PLANNING DEPT.


N
SCALE:
1:62,500
Highway 139
Hayden Hill Road
Preston Canyon
ACCESS/CORRIDOR ROUTES
MINE BLOCK
ACCESS/CORRIDOR ROUTE
ACCESS/CORRIDOR ROUTE
Hayden Hill
Letterbox Hill
Twin Lakes
Snide Lake
Manzanita Hill
Willow Creek
Donkey Hill
Bunselmeier Springs
Snyder Waterhole
Windmill Flat
Daisy Dean Spring
Juniper
MODOC NATIONAL FOREST
NATIONAL FOREST
STATE REFUGE
STATE
T 37 N
T 36 N
R 9 E
R 10 E

PROJECT NO. 29001	PREPARED BY:	**FIGURE 3.10-1**
DATE 11/90	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	HAYDEN HILL PROJECT CULTURAL RESOURCE STUDY AREAS
REVISION 0		


ACCESS/ CORRIDOR ROUTE
SCALE: 1:62,500
T 39 N
T 38 N
Highway 139
Adin
Ash
Gaging Station
Radio Facility
Ranger Station
Adin Cemetery
Adin Airport
Dibble Place
ASH VALLEY ROAD
INDEFINITE BOUNDARY
ALBAUGH ROAD
BASSETT ROAD
ARMSTRONG ROAD
BUTTE CREEK ROAD
Butte Creek
Brisco Butte
Chace Valley
Myers Reservoir
Knudsen Ranch
Scotty Place
Spring
Well
Cem
Hays
R 9 E
R 10 E
N

PROJECT NO.
29001

DATE
11/90

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0

PREPARED BY:

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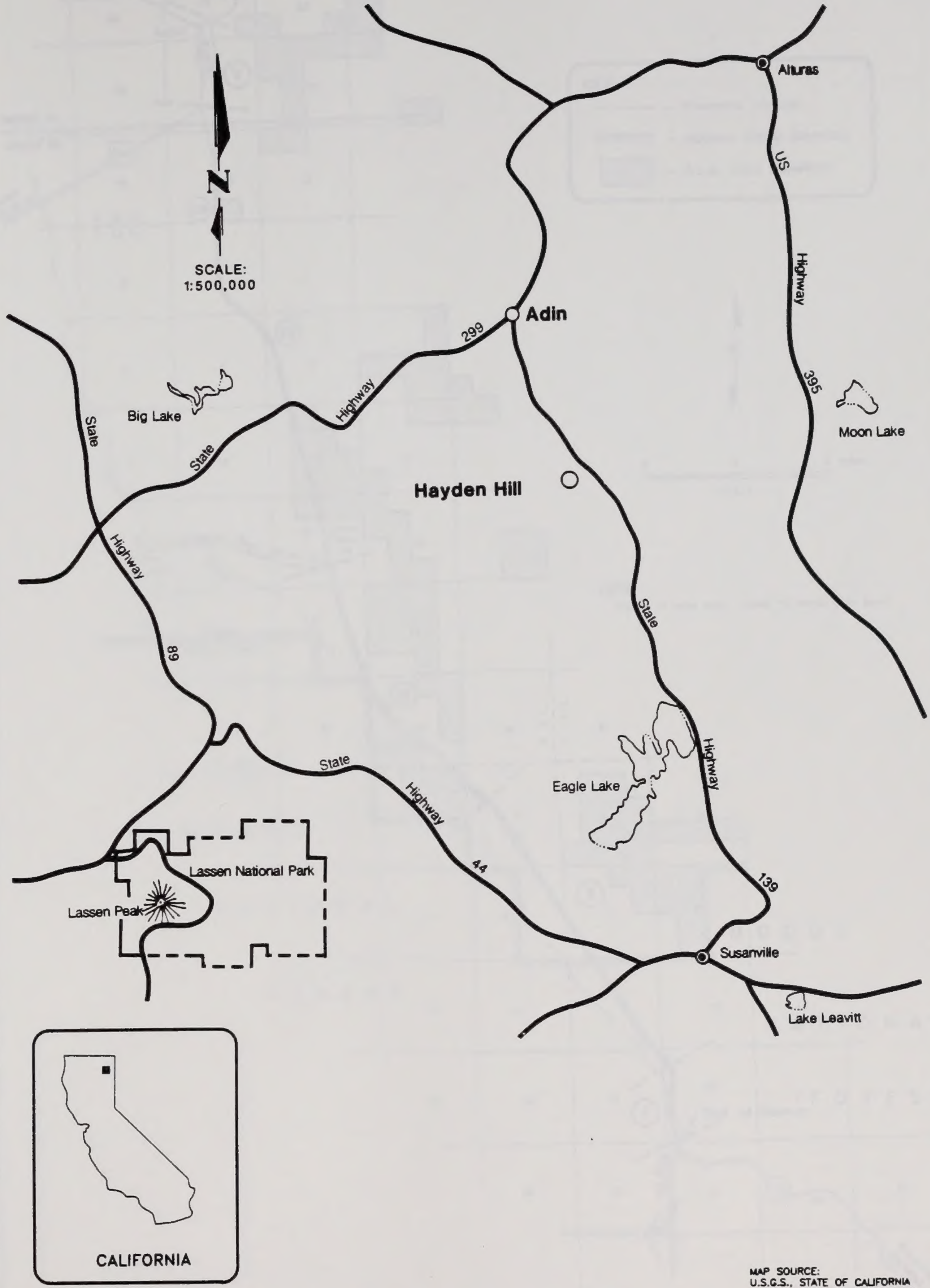
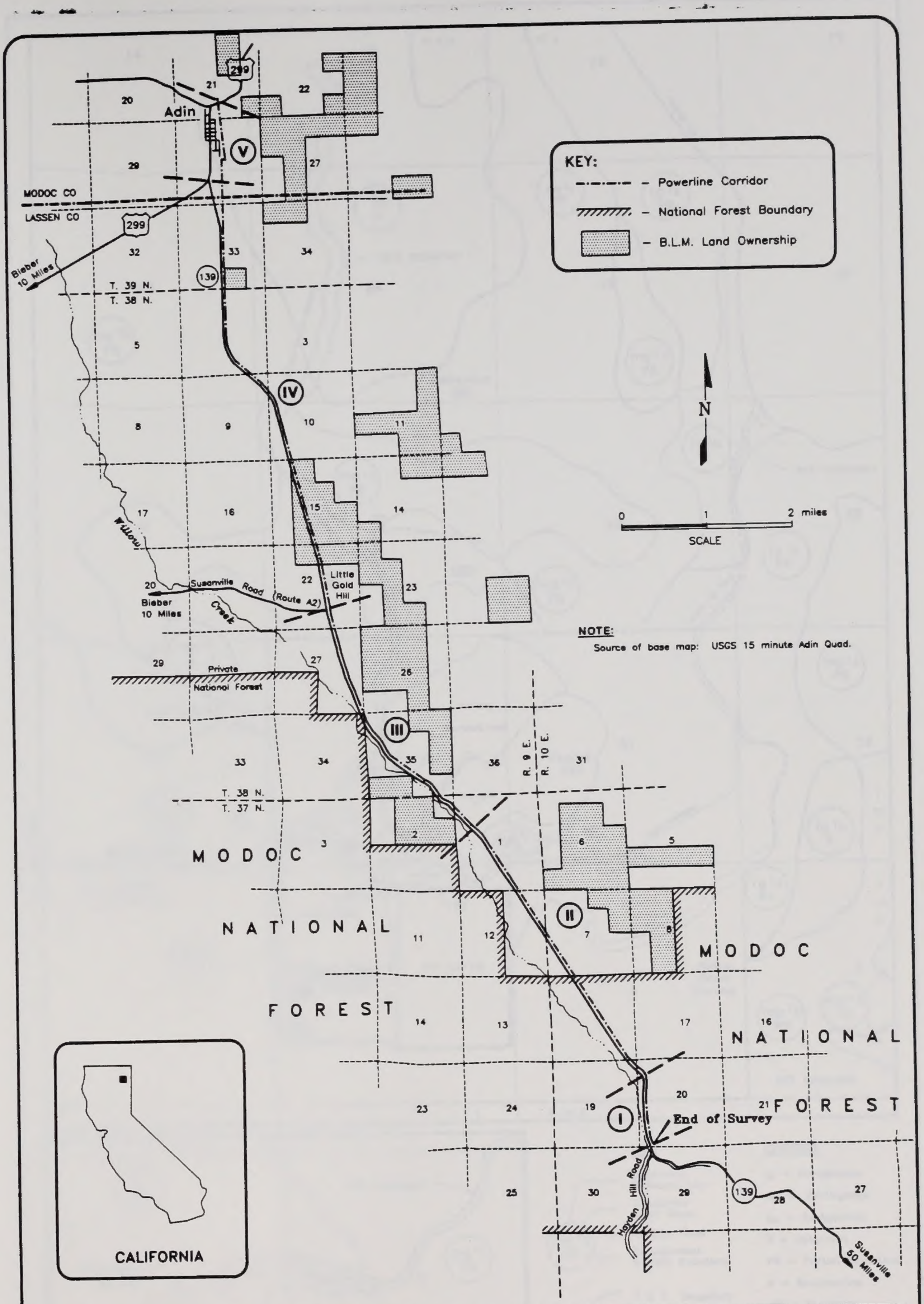
FIGURE 3.10-2

HAYDEN HILL PROJECT
CULTURAL RESOURCE STUDY AREAS


N
SCALE:
1:500,000
Alturas
US Highway 395
Adin
State Highway 299
Big Lake
Moon Lake
Hayden Hill
State Highway 89
State Highway 139
Eagle Lake
State Highway 44
Lassen National Park
Lassen Peak
Susanville
Lake Leavitt
CALIFORNIA

MAP SOURCE:
U.S.G.S., STATE OF CALIFORNIA
NORTH HALF MAP AT 1:500,000

PROJECT NO.	PREPARED BY:	**FIGURE 3.11-1**
29001	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	HAYDEN HILL PROJECT VISUAL RESOURCES REGIONAL CONTEXT MAP
DATE		
11/90		
REVISION		
0		



KEY:
– Powerline Corridor
– National Forest Boundary
▨ – B.L.M. Land Ownership
N
0 1 2 miles
SCALE
NOTE:
Source of base map: USGS 15 minute Adin Quad.
Adin
299
139
MODOC CO
LASSEN CO
Bieber 10 Miles
T. 39 N.
T. 38 N.
T. 37 N.
R. 9 E.
R. 10 E.
V
IV
III
II
I
Willow Creek
Susanville Road (Route A2)
Little Gold Hill
Private
National Forest
MODOC NATIONAL FOREST
End of Survey
Hayden Hill Road
Susanville 50 Miles
CALIFORNIA

PROJECT NO.	29001
DATE	11/90
REVISION	0

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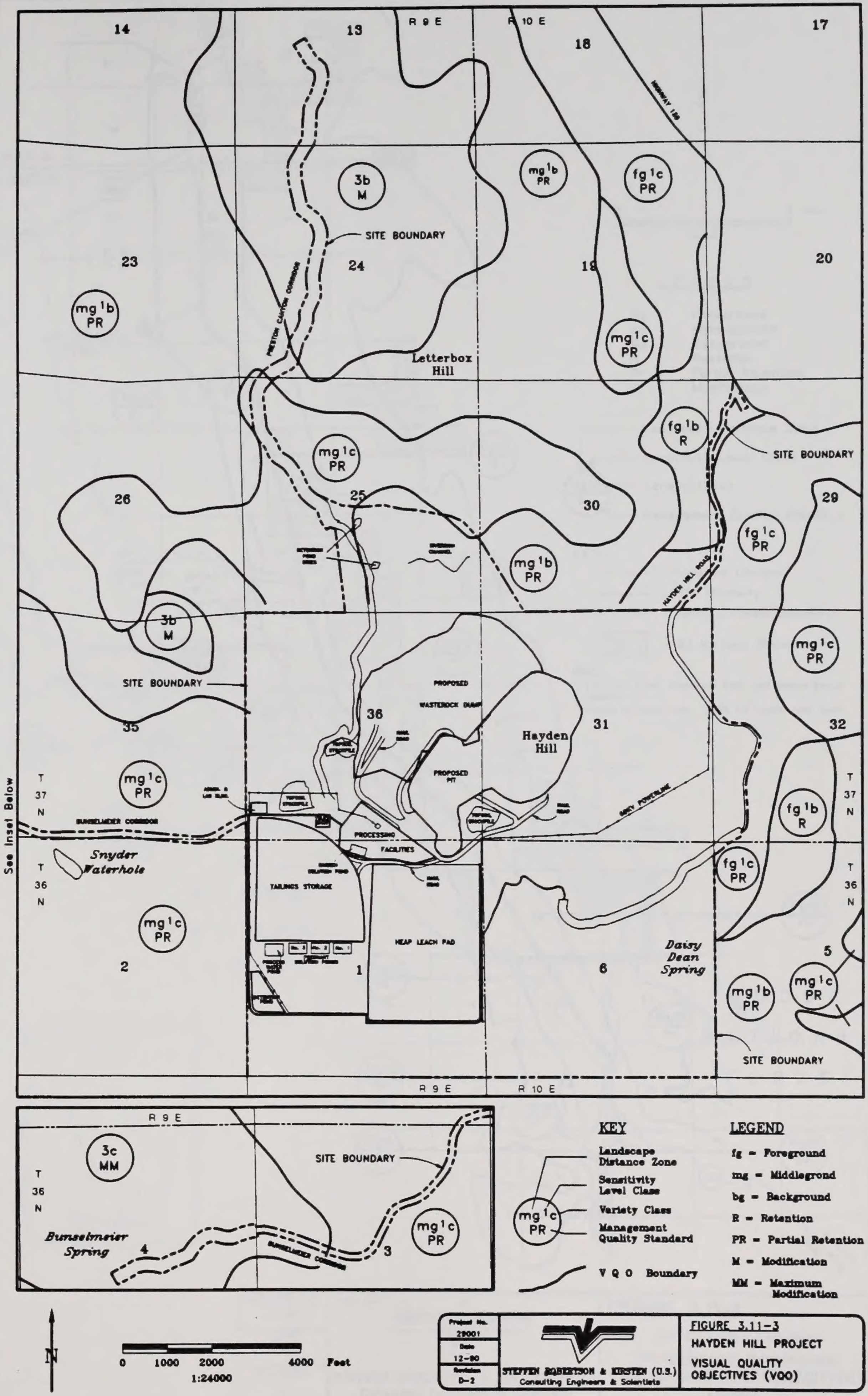
FIGURE 3.11-2

HAYDEN HILL PROJECT
VISUAL RESOURCES
HIGHWAY 139
CORRIDOR SEGMENTS


14
13
R 9 E
R 10 E
18
17
HIGHWAY 139
3b
M
mg 1b
PR
fg 1c
PR
SITE BOUNDARY
23
24
19
20
PRESTON CANYON CORRIDOR
mg 1b
PR
mg 1c
PR
Letterbox
Hill
fg 1b
R
SITE BOUNDARY
mg 1c
PR
26
25
30
29
fg 1c
PR
DIVERSION CHANNEL
mg 1b
PR
HAYDEN HILL ROAD
3b
M
mg 1c
PR
SITE BOUNDARY
PROPOSED
WASTEROCK DUMP
36
HAUL ROAD
Hayden
Hill
31
35
32
TOPSOIL STOCKPILE
PROPOSED
PIT
T
37
N
mg 1c
PR
fg 1b
R
BUNSELMEIER CORRIDOR
TOPSOIL STOCKPILE
HAUL ROAD
GREY POWERLINE
PROCESSING
FACILITIES
See Inset Below
Snyder
Waterhole
T
36
N
TAILINGS STORAGE
HAUL ROAD
fg 1c
PR
mg 1c
PR
HEAP LEACH PAD
Daisy
Dean
Spring
5
2
No. 3
No. 2
No. 1
1
6
mg 1b
PR
mg 1c
PR
SITE BOUNDARY
R 9 E
R 10 E
R 9 E
3c
MM
SITE BOUNDARY
T
36
N
Bunselmeier
Spring
4
BUNSELMEIER CORRIDOR
3
mg 1c
PR
KEY
Landscape
Distance Zone
Sensitivity
Level Class
Variety Class
Management
Quality Standard
mg 1c
PR
V Q O Boundary
LEGEND
fg = Foreground
mg = Middlegrond
bg = Background
R = Retention
PR = Partial Retention
M = Modification
MM = Maximum
Modification
N
0
1000
2000
4000
Feet
1:24000

Project No.
29001
Date
12-90
Revision
D-2

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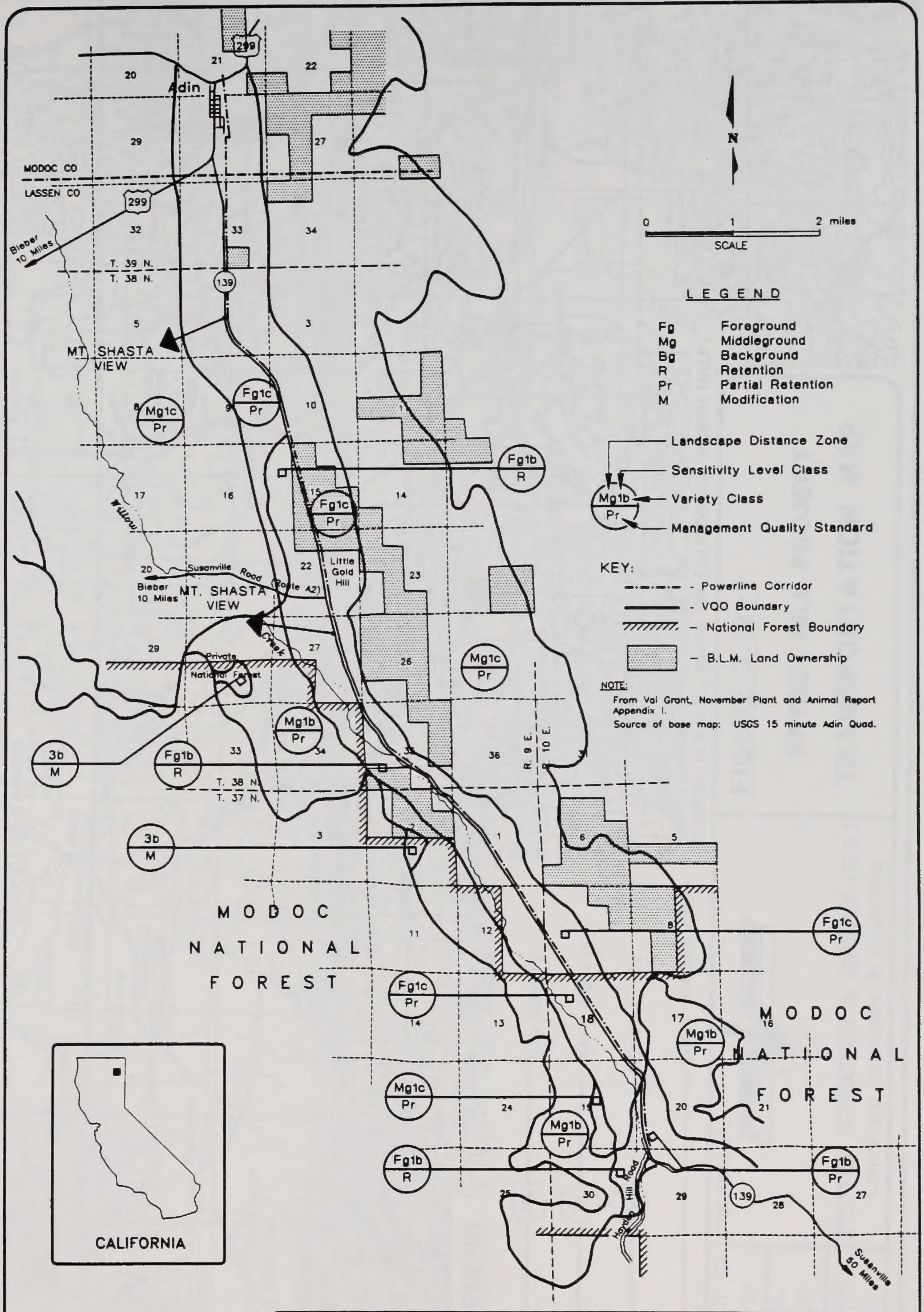
Consulting Engineers & Scientists

FIGURE 3.11-3
HAYDEN HILL PROJECT
VISUAL QUALITY OBJECTIVES (VQO)



Adin
299
MODOC CO
LASSEN CO
Bieber 10 Miles
T. 39 N.
T. 38 N.
139
MT. SHASTA VIEW
Willow Creek
Susanville Road (Route A2)
Bieber 10 Miles
Little Gold Hill
Private National Forest
T. 38 N.
T. 37 N.
R. 9 E.
R. 10 E.
MODOC NATIONAL FOREST
Hayden Hill Road
Susanville 50 Miles
Fg1c Pr
Mg1c Pr
Fg1b R
Mg1b Pr
3b M
Fg1b Pr
N
0 1 2 miles
SCALE
LEGEND
Fg Foreground
Mg Middleground
Bg Background
R Retention
Pr Partial Retention
M Modification
Landscape Distance Zone
Sensitivity Level Class
Variety Class
Management Quality Standard
KEY:
- Powerline Corridor
- VQO Boundary
– National Forest Boundary
– B.L.M. Land Ownership
NOTE:
From Val Grant, November Plant and Animal Report Appendix I.
Source of base map: USGS 15 minute Adin Quad.
CALIFORNIA

PROJECT NO.
29001

DATE
11/90

REVISION
0

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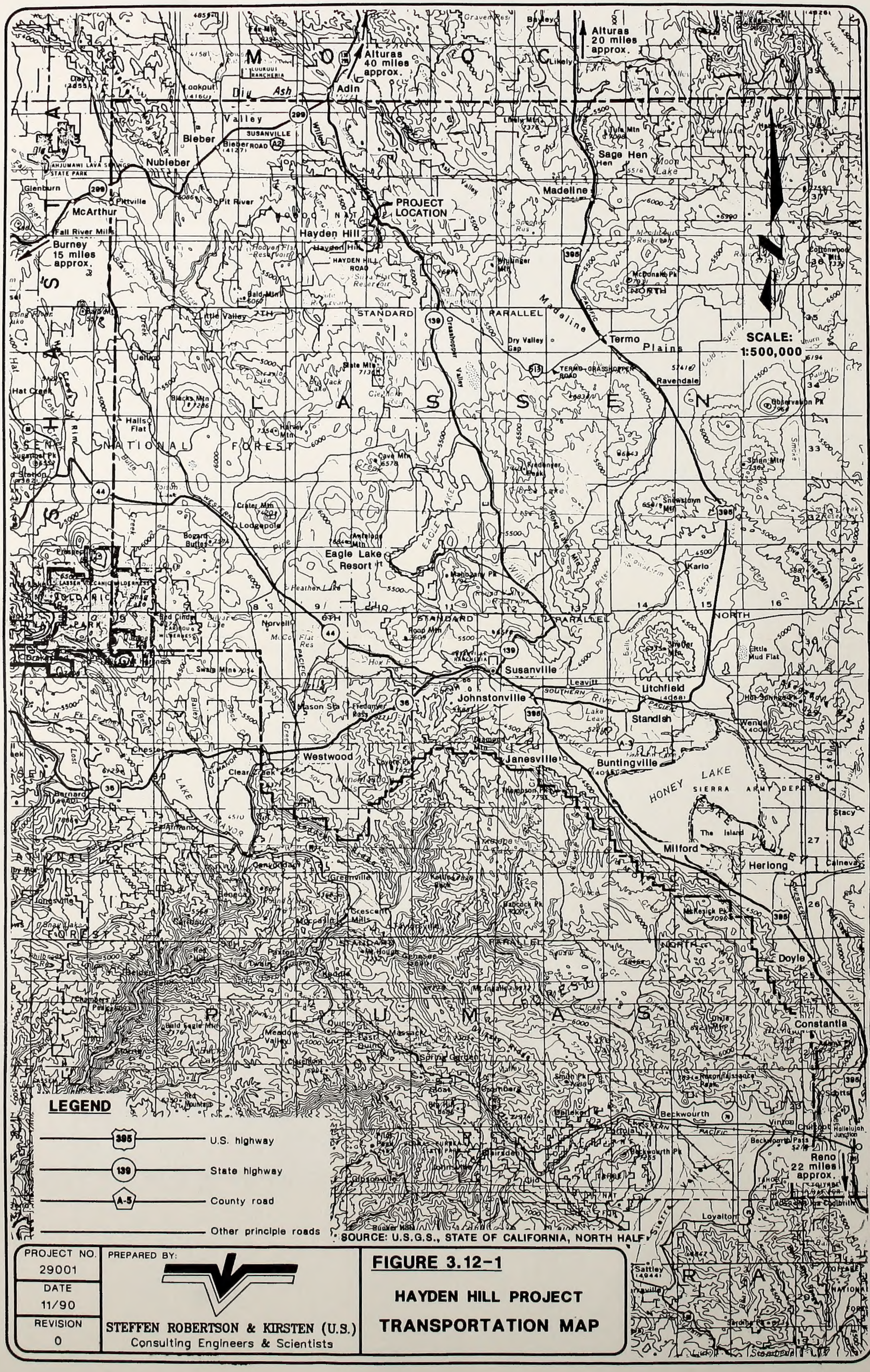
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

FIGURE 3.11-4

HAYDEN HILL PROJECT

POWERLINE CORRIDOR VISUAL QUALITY OBJECTIVES (VQO)


Alturas 40 miles approx.
Alturas 20 miles approx.
Burney 15 miles approx.
Reno 22 miles approx.
PROJECT LOCATION
Hayden Hill
HAYDEN HILL ROAD
SUSANVILLE ROAD
Adin
Likely
Lookout
Bieber
Nubieber
McArthur
Pittville
Pit River
Fall River Mills
Glenburn
AHJUMAWI LAVA SPRINGS STATE PARK
Big Valley
Madeline
Sage Hen
Termo
Madeline Plains
Ravendale
TERMO-GRASSHOPPER ROAD
Dry Valley Gap
Grasshopper Valley
Eagle Lake
Eagle Lake Resort
Susanville
Johnstonville
Litchfield
Standish
Leavitt
Buntingville
Janesville
Honey Lake
SIERRA ARMY DEPOT
Milford
Herlong
Wendel
Doyle
Constantia
Beckwourth
Vinton
Chilcoot
Loyalton
Westwood
Chester
Clear Creek
Lake Almanor
Canyondam
Greenville
Crescent Mills
Quincy
East Quincy
Meadow Valley
Portola
Blairsden
Graeagle
Clio
Sattley
Hat Creek
Old Station
Lodgepole
Norvell
Mason Sta
Little Valley
Jellico
LASSEN NATIONAL FOREST
PLUMAS NATIONAL FOREST
LASSEN VOLCANIC NATIONAL PARK
MODOC
LASSEN
SHASTA
PLUMAS
SIERRA
7TH STANDARD PARALLEL NORTH
6TH STANDARD PARALLEL NORTH
SOUTHERN PACIFIC
WESTERN PACIFIC
299
139
44
36
395
A2
A-3
513
SCALE: 1:500,000
LEGEND
395 U.S. highway
139 State highway
A-5 County road
Other principle roads

SOURCE: U.S.G.S., STATE OF CALIFORNIA, NORTH HALF

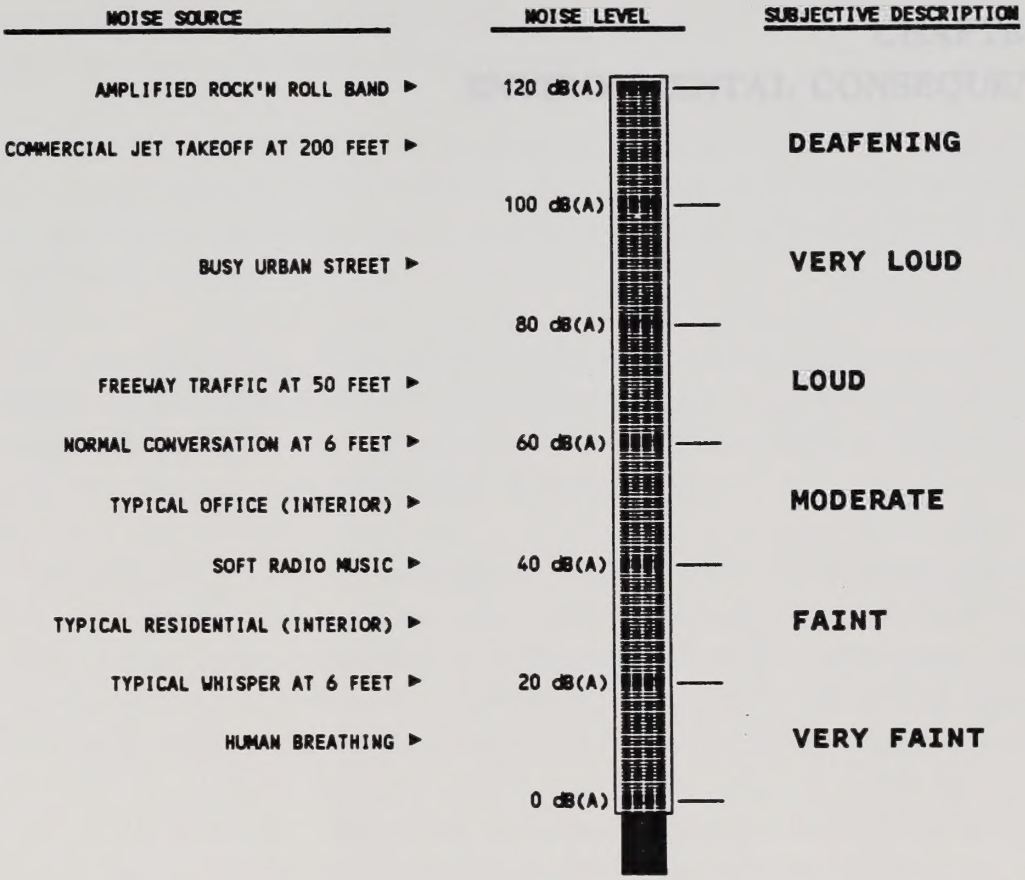
PROJECT NO.
29001
DATE
11/90
REVISION
0

PREPARED BY:
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

FIGURE 3.12-1

HAYDEN HILL PROJECT
TRANSPORTATION MAP

EXAMPLES OF NOISE LEVELS



PROJECT NO. 29001	PREPARED BY:	**FIGURE 3.14-1**
DATE 01/91		NOISE LEVELS SCALE
REVISION 0	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	

CHAPTER 4.0
ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

This chapter describes the foreseeable impacts to the existing environment that would not be avoided or reduced to insignificance by the Proposed Action. The alternatives are analyzed for impacts, as well. Mitigation measures are proposed to avoid or reduce these impacts if the Proposed Action or alternatives would be implemented. These impacts and mitigation measures are summarized in Table I of the Summary. Only significant impacts will be discussed in detail.

Adverse effects which could not be avoided if the Proposed Action and appropriate mitigation were implemented are summarized separately as Unavoidable Adverse Impacts. Impacts that would result from the Proposed Action combined with other activities and projects which take place in the Hayden Hill area are discussed as Cumulative Impacts.

Issues, Concerns, and Opportunities (ICOs) were identified during the scoping process. These are discussed in Chapter 1.0, and summarized in Chapter 6.0. The manner in which each ICO has been dealt with is discussed in this chapter. In some cases, the ICO was rectified by mitigation designed into the Proposed Action. In other cases, mitigation is proposed in this chapter.

This chapter is arranged by alternative, beginning with the Proposed Action. Each resource area is listed in a separate section for the Proposed Action, and only as they apply to each alternative. In the resource sections, the ICOs, impacts, mitigation measures, unavoidable adverse impacts, and cumulative impacts, if identified, are discussed as they apply to the specific resource. The ICOs that apply to a particular alternative, including the Proposed Action, are discussed at the beginning of each alternative section.

Other considerations; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, the irreversible and irretrievable commitment of resources, the growth-inducing effects of the Proposed Action, and energy consumption and conservation, are discussed for the Proposed Action and alternatives in Section 4.4 at the end of this chapter.

4.1.1 Methods Used to Evaluate Environmental Impacts

For the purposes of this Final Environmental Impact Report/Environmental Impact Statement (EIR/EIS), environmental impact is defined as a modification in the status of the environment as it presently exists or as it is anticipated to be in the future as a result of the Proposed Action or alternatives. Environmental impacts can be positive (beneficial) or negative (adverse), as a result of the action (direct) or as a secondary result (indirect), and can be permanent or long-lasting (long-term), or ephemeral (short-term).

Impacts can vary in degree or magnitude from no change, or a change which does not constitute a substantially adverse impact on the environment and related resources (not significant), to a total and typically adverse change in the environment (significant).

Evaluation of environmental consequences involves an initial determination of impact level due to a Proposed Action when no mitigation measures are imposed on that action. A subsequent evaluation then integrates the initial impacts with the proposed mitigation measures. The steps in the impact assessment and mitigation evaluation process are listed below:

1. Define the Proposed Action and alternatives;

2. Identify the types of impacts that may occur in the Project area as a result of implementation of the Proposed Action or any of the alternatives;

3. Identify the mitigation measures which apply to the impact of concern; and

4. Assess (quantify) the magnitude of the potential impacts after consideration of the mitigation measures.

An evaluation of environmental impacts must assess both the types and the magnitude of the identified impacts for each environmental resource present in the Project area (i.e.; the existing environment as described in Chapter 3.0). In addition, steps two and three need to be conducted both before and after incorporating any proposed mitigation measures.

In general, the criteria for evaluating each environmental discipline are similar. Criteria for determining the types of impacts which may occur include the following:

- Resource Sensitivity, the probable response of a particular resource to project-related activities;

- Resource Quality, the present condition of the resource potentially affected;

- Resource Quantity, the amount of the resource potentially affected; and

- Duration of Impact, the period of time over which the resources would be affected, measured as short-term (approximately 10 years, or mine life plus two years of reclamation) or long-term (greater than 10 years).

Detailed evaluation criteria for assessment of potential impacts have been established for some of the environmental resource areas as a result of standards in regulations or guidelines such as the Endangered Species Act (ESA), Clean Air Act (CAA), and the National Historic Preservation Act (NHPA). These standards or guidelines are summarized in the corresponding resource area section.

4.1.2 Mitigation Measures

The following list contains mitigation methods commonly used in the industry to reduce or negate environmental impacts from projects similar to the Hayden Hill Project:

- Avoiding the impact by not taking all or a part of a certain action;
- Minimizing impacts by limiting the degree or size of an action through engineering and management actions by the Applicant;
- Rectifying the impact by repairing, rehabilitating or reclaiming the affected environment;
- Reducing or eliminating the impact over time by preservation or maintenance; and
- Compensating for the impact by replacing or providing substitute resources or environments.

Many mitigation measures intended to reduce potential environmental impacts will be implemented through existing agency rules and regulations. These rules and regulations are summarized in this chapter for each applicable resource area. Preliminary planning and design efforts for the Project have incorporated provisions for compliance with these rules and regulations (see Chapter 2.0, Description of the Proposed Action). Mitigation measures designed into the Proposed Action, including those necessary for compliance, were considered in the impact analysis, and are summarized therein.

In addition to the regulatory requirements, the evaluations completed in this chapter will identify specific mitigation measures which cover the foreseeable impacts for each environmental resource. An indication of the effectiveness of these mitigation measures, or significance after mitigation, is presented in Table I for the Proposed Action and each alternative. Those impacts that cannot be mitigated to a satisfactory degree are summarized at the end of each resource section as unavoidable adverse impacts.

An impact analysis has also been completed for each alternative to the Proposed Action. This analysis and mitigation measures specific to each alternative are discussed in Section 4.3.

In compliance with State of California Public Resources Code Section 21081.6, a monitoring program will be implemented to demonstrate compliance with measures adopted as conditions of approval to avoid significant effects to the environment. The program will, at minimum, identify what measure was undertaken, when it was completed and the agency having jurisdiction by law over the natural resource. A Mitigation Compliance Program for the Hayden Hill Project is presented in Appendix D.

4.1.3 Unavoidable Adverse Impacts

Most of the foreseeable impacts to the existing environment would be adequately mitigated by the Proposed Action and the mitigation measures proposed in this chapter. However, unavoidable adverse impacts would still occur if the Project were implemented.

Unavoidable adverse impacts may be short-term or long-term and direct or indirect. Unavoidable adverse impacts may also be significant or insignificant after the application of mitigation. For example, some short-term unavoidable adverse impacts to vegetation may be adequately mitigated by post-mining reclamation, and, therefore, these impacts would be insignificant. The significance of each unavoidable adverse impact is identified in the summary of these impacts following each resource area in Section 4.2. A summary of the significance of the unavoidable adverse impacts can also be found in Table I.

Unavoidable adverse impacts would occur in the following resource areas. These impacts are summarized in Table 4.1-1.

- Geology and Topography
- Soils
- Vegetation
- Wildlife
- Water Resources
- Socioeconomics
- Land Use
- Cultural Resources
- Visual Resources
- Recreation
- Noise

Impacts to the remaining resource areas (Air Quality and Transportation) were either beneficial, insignificant, or would be mitigated by the Proposed Action to a point where they were insignificant. This is discussed in more detail following each of these resource areas in Section 4.2.

TABLE 4.1-1

PROPOSED ACTION AND ALTERNATIVES
COMPARATIVE UNAVOIDABLE ADVERSE IMPACTS

		Pit Backfilling Alternatives		Waste Rock Dump Design Alternatives					Enclosed Cyanide System Alternative		
Resource Category	**Proposed Action**	**Comprehensive Backfilled Pit**	**Partially Backfilled Pit**	**Complete Benching**	**Smoothed**	**Facilities Location Alternative 3**	**Power Supply Alternative**	**Fire Tower Alternative**	**Floating Cover**	**Process Solution Tanks**	**No Action Alternative**
Geology and Topography											
1. Topographic changes.	1. Impact: Hayden Hill will be modified into a pit, an unnatural landform for the region.	1. Lesser Impact: The topographic impact of the pit would be eliminated.	1. Slightly Lesser Impact: The pit would remain an unnatural landform.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. No Impact.
2. Future exploration.	2. Impact: No impact is expected since mineralization in the pit walls would be exposed.	2. Greater Impact: Evidence of mineralization in the pit would be covered, making future geologic exploration difficult.	2. Greater Impact: Evidence of mineralization in the Providence zone would be covered, making future geologic exploration difficult.	2. Similar Impact: Pit walls would be exposed.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. No Impact.
Soils											
1. Loss of soil productivity.	1. Impact: Loss of 296 acres of commercial quality timber producing soils will create a long-term impact.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. No Impact.
2. Loss of soil structure.	2. Impact: 380 acres of duripan or shallow to bedrock soils which support Low Sagebrush habitat will be lost, creating a long-term impact.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Greater Impact: An additional 11.5 acres of duripan soils will be excavated.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. No Impact.
3. Erosion and sediment potential.	3. Impact: The potential for erosion and sedimentation is increased, resulting in a short-term impact.	3. Greater Impact: Erosion and sedimentation potential would be higher due to increased time of exposure.	3. Similar impact to Proposed Action.	3. Lesser Impact: Erosion and sediment potential would be decreased compared to the Proposed Action.	3. Greater Impact: Erosion and sediment potential would be increased compared to the Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. No Impact.
Vegetation											
1. Loss of commercial quality timber stand.	1. Impact: 105 acres of commercial quality timber stand will be lost resulting in a long-term impact.	1. Similar impact to Proposed Action.	1. Similar impacts to Proposed Action.	1. Greater Impact: 20 additional acres of commercial timber stand will be disturbed.	1. Greater Impact: 52 additional acres of commercial timber stand will be disturbed.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. No Impact.
2. Loss of vegetative cover and habitat.	2. Impact: 950 acres of vegetation and associated habitat value will be lost.	2. Similar Impact: Slightly more area could be reclaimed.	2. Similar Impact: Slightly more area could be reclaimed.	2. Greater Impact: Reclamation may result in more revegetated area. However, 20 more acres of habitat value will be lost.	2. Greater Impact: Reclamation may result in complete revegetation. However, 52 more acres of habitat value will be lost.	2. Greater Impact: An additional 11.5 acres of Low Sagebrush vegetation and associated habitat will be lost.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Greater Impact: An additional 2.5 acres of Low Sagebrush vegetation and associated habitat will be lost.	2. Lesser Impact: Existing disturbance to the site will not be reclaimed.
3. Loss of wetlands vegetation.	3. Impact: 6.55 acres of wetlands, 80 lineal feet of permanent stream and 1,315 lineal feet of intermittent stream channel will be lost creating a short-term impact.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Lesser Impact: The impact to wetlands is reduced to 2.5 acres.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. No Impact.
Wildlife											
1. Habitat Impact.	1. Impact: Habitats lost or altered include: two sage grouse leks; one prairie falcon nest; a portion of one goshawk pair's home range; loss of Low Sage, wetlands, Jeffrey pine and short-term impact to rock outcrop habitats.	1. Similar Impact: The pit would not be available for raptor nesting.	1. Similar impact to Proposed Action.	1. Greater Impact: More habitat will be lost during mining than the Proposed Action, however, reclamation would result in slightly more revegetated area than the Proposed Action.	1. Greater Impact: An additional 52 acres of Jeffrey Pine/Mountain Shrub and Upland Shrub habitat would be lost. Mature forest, an important habitat for goshawks, may be lost.	1. Similar Impact: More Low Sagebrush habitat will be lost.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Greater Impact: Approximately 2.5 acres of Low Sagebrush habitat would be lost.	1. No Impact.
2. Terrestrial Wildlife Impact.	2. Impact: Disturbance from noise, dust and traffic, and increased access. Potential mortalities due to road kill or toxics. Potential loss of sage grouse population. Migration routes for deer and pronghorn may be altered.	2. Greater Impact: Extended Project life would increase length of time of disturbance due to human activity, noise, dust, etc.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Greater Impact: Extended Project life would increase length of time of disturbance due to human activity, noise, dust, etc.	2. Similar impact to Proposed Action.	2. Lesser Impact: Growth inducing potential would be lessened.	2. Similar impact to Proposed Action.	2. Lesser Impact: There would be less potential for losses of small birds and bats and less chance of net entanglement.	2. Lesser Impact: There would be less potential for losses of small birds and bats and less chance of net entanglement.	2. No Impact.
3. Aquatic Wildlife Impact.	3. Impact: Benthic habitat and riparian habitat will be lost due to road improvements where Hayden Hill Road crosses Willow Creek. Construction activities will result in short-term habitat disruption and sediment introduction into the creek.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Lesser Impact: Run-off may be slowed which would reduce the release of sediments in the Preston Canyon drainage.	3. Greater Impact: Run-off and sedimentation would be increased.	3. Lesser Impact: Aquatic life associated with seeps, springs and stock pond would not be impacted.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. No Impact.
Water Resources											
1. Water Use.	1. Impact: About 1,600 acre-feet would be consumed annually (12,800 acre-feet for 8-year operation).	1. Similar Impact: Water consumption for dust control will be required an additional four years.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar Impact: Water consumption for dust control will be required an additional one to two years.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. No Impact.
2. Potential effect to minor springs and seeps.	2. Impact: Low flow (≤1gpm) minor springs and seeps located in near proximity to the pit area, will likely be diminished or stopped.	2. Similar Impact: Minor springs and seeps will still be affected.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. No Impact.

Explanation: In this table, the anticipated unavoidable adverse impacts of each alternative are compared to those associated with the Proposed Action as "greater", "similar", or "lesser" impact. "No impact" is shown where no unavoidable adverse impacts are expected to occur. Unavoidable adverse impacts are not anticipated to occur to Air Quality and Transportation, two additional environmental resource areas discussed in the Draft EIR/EIS, and therefore, do not appear in this comparison. Note that all unavoidable adverse impacts identified are listed in this table. Not all of the unavoidable adverse impacts are significant. For a statement of significance for each impact, see Chapter 4.0 or Table I.

TABLE 4.1-1

PROPOSED ACTION AND ALTERNATIVES
COMPARATIVE UNAVOIDABLE ADVERSE IMPACTS
(Continued)

		Pit Backfilling Alternatives		Waste Rock Dump Design Alternatives					Enclosed Cyanide System Alternative		
Resource Category	**Proposed Action**	**Comprehensive Backfilled Pit**	**Partially Backfilled Pit**	**Complete Benching**	**Smoothed**	**Facilities Location Alternative 3**	**Power Supply Alternative**	**Fire Tower Alternative**	**Floating Cover**	**Process Solution Tanks**	**No Action Alternative**
Socioeconomics											
1. Fiscal operating deficits.	1. Impact: Due to California school financing mechanisms, increased student enrollment costs will not be met by State funding. Each school district will likely operate at a fiscal deficit.	1. Greater Impact: Comprehensive backfilling will require an additional four years of operations and school district fiscal operating deficits.	1. Similar Impact: School districts would still be operating at a deficit.	1. Similar impact to Proposed Action.	1. Greater Impact: An additional one to two years of school district fiscal operating deficit would occur.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Lesser Impact: Loss of potential jobs/revenues.
Land Use											
1. Livestock grazing forage reduction.	1. Impact: The 950 acres of lands removed by Project activities would reduce livestock forage by about 67 animal unit months (AUMs).	1. Similar Impact: The 950 acres of disturbance would reduce available livestock forage by about 67 AUMs.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar Impact to Proposed Action.	1. Similar impact to Proposed Action.	1. No impact.
2. Development and growth induced by installation of power transmission line.	2. Impact: Long-term growth induced by the new power transmission line. New opportunities for land development would occur to surrounding rural area.	2. Similar Impact: New development and growth opportunities would still exist.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Lesser Impact: If the Applicant owns the power transmission line, there is no legal requirement to allow public access to the power. Thus, new opportunities for development and growth would be lessened.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. Similar impact to Proposed Action.	2. No impact
3. Elimination of forest lands used for commercial timber production.	3. Impact: About 105 acres of Federal commercial forest land will be eliminated from production due to facilities locations. These lands are not expected to support commercial timber after reclamation.	3. Similar Impact: About 105 acres of commercial timber would be eliminated.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Greater Impact: An additional 52 acres of commercial timber would be impacted.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. Similar impact to Proposed Action.	3. No impact.
4. Elimination of designated Agricultural Preserve lands.	4. Impact: The Williamson Act contract, pertaining to 658 acres that would be disturbed by mining activities, mcy be cancelled.	4. Similar Impact: About 658 acres of Agricultural preserve would have to be reclassified.	4. Similar impact to Proposed Action.	4. Similar impact to Proposed Action.	4. Similar impact to Proposed Action.	4. Similar impact to Proposed Action.	4. Similar impact to Proposed Action.	4. Similar impact to Proposed Action.	4. Similar impact to Proposed Action.	4. Similar impact to Proposed Action.	4. No impact.
Cultural											
1. Cultural.	1. Impact: Prehistoric sites, historic archaeological sites and historic architectural sites would be altered or destroyed.	1. Similar Impact: The cultural sites would be altered or destroyed.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. No impact.
Visual Resources											
1. Operational activities.	1. Impact: Topsoil stripping, the waste rock dump, the upper pit areas, the power line installation, and Hayden Hill Road improvements would be viewed from Highway 139. All Project facilities and operations would be viewed from secondary roads and low hills in the area.	1. Similar Impact: The waste rock dump would create the same visual impact during mine life.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Greater Impact: The size and material of these structures would contrast with the surrounding area.	1. No impact.
2. Site topography and visibility changes.	2. Impact: The pit, waste rock dump and heap leach and tailings facilities would permanently alter Hayden Hill and surrounding topography. The reclaimed pit highwalls would remain apparent in the landscape since rock walls are not typical of the area.	2. Lesser Impact. The waste rock dump would be eliminated, lessening long-term impacts from Highway 139. The number of steep slopes and pit highwalls would be reduced, creating landforms similar to the landscape.	2. Lesser Impact: The waste rock dump would be slightly smaller and created landforms more compatible with surroundings, lessening visual impacts.	2. Similar Impact: The additional benches would be more conducive to reclamation, which is critical to reduce visual impacts caused by the waste rock dump. However, the additional benches would not be viewed from Highway 139 or the south.	2. Lesser Impact: The elimination of benches would result in a more natural appearing landform. However, reclamation success is critical to reduce visual impacts. Reclamation of this alternative will be more difficult.	2. Similar impact to Proposed Action.	2. Lesser Impact: Proper installation of the power line is within the Visual Quality Objective for the area. However, removal would improve the visual quality of this area.	2. Similar impact to Proposed Action.	2. Similar Impact: The pond areas will be reclaimed after Project completion.	2. Similar Impact: These structures will be removed after Project completion.	2. Lesser Impact: Visual impacts from preexisting disturbance at the site do not meet Visual Quality Objectives for the area.
Recreation											
1. Loss of historic Hayden Hill Mining District.	1. Impact: The Hayden Hill Mining District will be altered or demolished from its present condition.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar to Proposed Action.	1. Similar to Proposed Action.	1. Similar to Proposed Action.	1. Similar to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. No impact.
Noise											
1. Increased noise levels in the pit area.	1. Impact: Noise levels in close proximity to the pit area will reach 60 to 70 dB during operation.	1. Greater Impact: Noise impacts would remain an additional four years.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Greater Impact: Noise levels would remain an additional one to two years.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. Similar impact to Proposed Action.	1. No impact.

Explanation: In this table, the anticipated unavoidable adverse impacts of each alternative are compared to those associated with the Proposed Action as "greater", "similar", or "lesser" impact. "No impact" is shown where no unavoidable adverse impacts are expected to occur. Unavoidable adverse impacts are not anticipated to occur to Air Quality and Transportation, two additional environmental resource areas discussed in the Draft EIR/EIS, and therefore, do not appear in this comparison. Note that all unavoidable adverse impacts identified are listed in this table. Not all of the unavoidable adverse impacts are significant. For a statement of significance for each impact, see Chapter 4.0 or Table I.

Unavoidable adverse impacts caused by the Proposed Action would apply to the alternatives as well. In some cases, implementation of an alternative may cause additional unavoidable adverse impacts. These impacts, if applicable, are discussed following each alternative in Section 4.3. A comparison of the unavoidable adverse impacts associated with the Proposed Action to those associated with each alternative, if implemented, is presented in Table 4.1-1.

4.1.4 Cumulative Impacts

4.1.4.1 Issues, Concerns, and Opportunities (ICOs)

Issues and concerns related to cumulative impacts are listed below:

1. What would be the cumulative effects of the Project?

No set manner of evaluating cumulative impacts is established within the California Environmental Quality Act (CEQA) or National Environmental Policy Act (NEPA) guidelines. Cumulative impacts could be considered to be the cumulative effects of the several facilities on-site or could result from the identified impacts of the Proposed Action in conjunction with impacts resulting from other projects and activities in the area. These activities and projects may have taken place in the past, be concurrent with the Proposed Action, or, will take place in the reasonably foreseeable future.

The actions listed below were the only activities and projects identified which may have a cumulative effect on the impacts predicted for the Project. There are no other precious metal mining projects, presently operating or proposed, in the vicinity of the Hayden Hill Project.

- Timber Harvesting
- Grazing
- California Correctional Center Expansion
- Sierra Army Depot
- Lassen College Cogeneration Project

All of the resource areas were evaluated for cumulative impacts. In the analyses of cumulative impacts for the Hayden Hill Project, the focus will be on the proposed projects and activities identified above, along with the Proposed Action, and the resource areas listed below. Cumulative impacts are discussed in detail in the resource areas indicated below:

- Soils (Timber Harvesting, Section 4.2.3.5)
- Vegetation (Timber Harvesting, Section 4.2.4.5)

- Wildlife (Grazing; Timber Harvesting, Section 4.2.5.7)
- Water Resources (Timber Harvesting, Section 4.2.6.5)
- Socioeconomics (California Correctional Center Expansion; Sierra Army Depot, Section 4.2.8.12)
- Land Use (Timber Harvesting, Section 4.2.9.8)
- Transportation (Lassen College Cogeneration Project, Section 4.2.12.5)

No significant cumulative impacts were identified for the remaining resource areas, Geology and Topography, Air Quality, Cultural Resources, Visual Resources, Recreation, and Noise. This is discussed in Section 4.2 following each of these resources.

4.2 Proposed Action

4.2.1 Issues, Concerns, and Opportunities

Issues and concerns related to mining operations and alternative design follow:

1. What consideration of other gold extraction methods has been done?

2. Will a monitoring plan be completed and compliance be required?

3. How will cyanide handling, storage, use and control be accomplished?

4. Will emergency mitigation and planning be done?

5. Will adequate alternative development including alternatives for the power line corridor and access be done?

6. What are the land management objectives for post mining use?

Issues 1 and 5 are related to the alternative analysis completed for the Project, and are discussed in detail in Chapter 2.0, Section 2.3, Alternatives. In regard to issues 2 and 4, monitoring and emergency response plans are required by the various permits which will be needed for the Project and is described in this section. The requirements of the regulations which apply to each resource area are summarized at the beginning of the impacts sections which follow. A Mitigation Compliance Plan is included in Appendix D.

Issue 3 deals with cyanide handling, storage, use and control. This is discussed throughout the document. Chapter 2.0 details the methods and practices proposed for the use of this substance. Chapter 4.0

identifies the impacts related to its use and proposes further mitigation measures. A Spill Prevention, Control and Countermeasure Plan (SPCC) and Emergency Response Plan (ERP) has been prepared and placed on file with the Lassen County Planning Department by the Applicant. The SPCC/ERP is included in Appendix L.

In regard to Issue 6, a Reclamation Plan has been prepared by the Applicant the Reclamation Plan has evolved with the EIR/EIS process. The Reclamation Plan is summarized in Chapter 2.0 and is included in this document in Appendix E. The post-mining land use objectives are included in this Plan. It should be noted that the Reclamation Plan includes the Complete Benching Alternative and the Power Supply Alternative in anticipation that these alternatives will be required.

Issues and concerns pertaining to building a new fire lookout tower to replace the Hayden Hill fire tower are listed below:

1. Does the new lookout tower location best suit fire lookout needs?

2. Will the new lookout tower location have minimum impact on the environment?

In regard to Issue 1, selecting a site that will best suit fire lookout needs, the following items were listed as desirable features in a fire lookout location: Minimum viewshed overlap with other fire lookouts and established communities; maximum viewshed acreage and viewsheds of areas sensitive to fire, such as forest plantations and isolated areas. Lookouts are rated by their number of forest fire sightings with respect to other lookouts in the area. The above mentioned desirable features are designed to improve a lookout's first sighting percentage. The areas around the Gerig burn and Silva Flat were identified by the United States Forest Service (USFS) and the California Department of Forestry and Fire Protection (CDFFP) as the priority view sites in the Hayden Hill area.

With regard to issue 2, minimizing environmental impact, each site was evaluated for impacts to the environment.

4.2.2 Geology and Topography

4.2.2.1 Issues, Concerns, and Opportunities

Issues and concerns related to Geology and Topography are listed below:

1. What hydrologic (peak event basis) and geotechnical practices will be used in Project design?

2. Are there any known geologic hazards in the areas of influence?

In regard to issue 1, peak storm events used for Project design are discussed in Section 2.2.5. Information from geotechnical investigations for the heap leach pad, tailings impoundment, and waste rock dump are found in Section 3.2.5.

In regard to issue 2, a seismic risk analysis was carried out for the Project site. Earthquake design criteria for all structural components of the surface facilities should be in accordance with Lassen County requirements, and Uniform Building Code standards which place the site in a Seismic Zone 3. This is discussed in more detail in Sections 3.2.4 and 4.2.2.2.

4.2.2.2 Impacts to Topography and Geology as a Result of the Proposed Action

The following section discusses potential impacts to the topography and geology of the Project site as a result of the Proposed Action. The impact analysis includes the consideration of mitigation measures already incorporated in the Proposed Action as part of Project design. For this analysis, an impact would be potentially significant if any of the following occur:

- A change in topography or ground surface relief features;
- The destruction, covering or modification of any unique geologic or physical features;
- The exposure of people or property to geologic hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards; or
- The creation of a potential public health hazard due to unstable earth conditions.

The first two items concern the modification of the topography of the Project site as a result of the Proposed Action. The last two items involve the potential occurrence of geologic hazards, such as seismic activity at the Project site, or the creation of unstable landforms as a result of the Proposed Action.

Impacts to topography and geology will be associated with the main components of the Proposed Action including the open pit, waste rock dump, heap leach and tailings facilities, processing facilities, and access and haul roads. Anticipated effects include direct and indirect impacts, beneficial and adverse impacts, and short-term and long-term impacts.

Topography

The open pit and mining facilities would result in a permanent modification of the topography and landscape of the Project site. See Figure 2.2-8 for an approximation of post reclamation contours of the Project area.

Impacts to visual resources resulting from modifications to topography and the landscape are discussed in Section 4.2.11.

Long-term Impacts - The most significant direct impact to the topography of the Project site will be caused by the development of the open pit on Hayden Hill. The final pit will disturb approximately 176 acres. The Lookout zone of the pit will be roughly centered on the summit of Hayden Hill. Upon completion of this zone, the summit of Hayden Hill, which is 6,300 feet in elevation, will have been removed. A new summit of the hill, approximately 6,180 feet in elevation, will be located approximately 800 feet west of the existing peak between the Lookout and Providence zones. The bottom of the 700-foot deep Lookout zone area of the pit will be at an approximate elevation of 5,400 feet upon completion of mining.

The Providence zone of the pit will form an elongated depression on the rounded west slope of Hayden Hill. The Providence zone will be approximately 380 feet deep with the elevation of the bottom of the pit at about 5,720 feet. At closure, the pit area will be left in a rough, coarse condition wherever possible to promote diversity of topography and to simulate existing and surrounding conditions of the area.

The waste rock dump on the north side of Hayden Hill will change the relatively steep hillside to a partially benched or terraced slope with an overall gradient of 3H:1V. The terraces will consist of benches with 100 foot high slopes between each bench from the top down to the 5750 foot level. Below the 5750 foot level, the dump will be at the natural angle of repose, approximately 1.3H:1V. Total disturbance due to the dump will be 206 acres.

At closure, the waste rock dump will be reclaimed to blend into the surrounding topography to the extent practical. The waste rock dump top and sides will be rounded and contoured. Large rocks will be strategically placed along the benches and slopes to promote topographic diversity.

The heap leach facility will create a 120 foot high mound covering approximately 199 acres in an area that is presently a fairly flat valley. The tailing facility will form a 75 foot high, raised, gently sloping area that will disturb 131 acres of land. The associated process ponds will form depressions disturbing 23 acres.

The goal of reclamation efforts for the heap leach and tailings facilities will be the creation of contoured, vegetated sloping land which blends into the surrounding slopes of the area. These facilities will be recontoured at Project closure to facilitate drainage and alter straight lines.

Within the context of the Project site, the topographic effects of the Proposed Action could be considered adverse because of the change in landforms and contours that will result. However, in a regional context the adverse effects would be very low. The Project area lies in an area of low volcanic hills disrupted by numerous faults. Direct, long-term changes in landforms due to the waste rock dump, and heap leach and tailings facilities would conform to the regional topography. During operations, slopes will be shaped for reclamation as much as practicable during the material placement or removal. During reclamation, sharp edges will be rounded and straight lines will be altered to provide contours which are visually and functionally compatible with the surrounding terrain. Therefore, the direct, long-term impacts of most of the Project components to topography would not be considered adverse or significant. In addition, some of the changes may be beneficial since the variation in topography will provide niches and micro-environments for plant and animal diversity.

However, the modification of Hayden Hill due to the development of the open pit would introduce an unnatural landform to the area. This would result in a direct, long-term adverse impact to topography. This impact is considered significant.

Short-term Impacts - Buildings and structures (administration, process facility, crusher and mill site, storage and shop facilities, etc.) will be located on a leveled area totalling 70 acres. Growth media storage areas will cover 22 acres. The access road and utility corridors will modify approximately 123 acres. These Project components will cause direct, short-term, adverse impacts to topography.

At the end of mining all buildings and structures will be dismantled and removed from the site. Concrete foundations and any paved areas will be reduced to rubble and buried on site. The remaining disturbances will be contoured and reclaimed. Haul and access roads requiring reclamation, will be graded to create undulating landforms or have the edge berm pulled back prior to revegetation. Growth media stockpiles will be removed during replacement of growth media on disturbed areas. These direct, short-term, adverse impacts will be eliminated, therefore short-term impacts to topography are not considered significant.

Geology

Hazards due to geologic events - Geologic events, such as earthquakes or ground rupture, could result in the severe damage or destruction of one or more Project components. In addition, the release of chemicals into the environment could result from the occurrence of a geologic event. Damage, destruction, or chemical contamination would lead to direct and indirect, short-term and long-term, adverse impacts.

See Section 3.2.4 for a discussion of seismicity in the Project area. The region of Hayden Hill contains few major faults. No active faults are known to exist within several miles of the Project area. Therefore, there is very little potential for ground rupture on the Project site.

The Hayden Hill Project area is within Seismic Zone 3 according to the Uniform Building Code (1985) which corresponds to the potential for major damage during an earthquake event. However, historically few earthquakes have occurred near the site. The most significant earthquakes in the region have been associated with the Honey Lake Fault to the southeast. The closest earthquake event of significance was an estimated Magnitude 6.0 event which occurred in 1875 just south of Susanville and at a distance of 50 miles. Along the same fault system, a similar Magnitude 6.0 event occurred in 1966 at a distance of 106 miles from the site.

Seismic risk analyses for the Project site were conducted by Welsh Engineering, Inc. (1989a) and Knight and Piésold, Ltd. (KP) (1990b). For low risk geotechnical structures, such as the waste rock dump, a return period of 100 years was used for seismic events. For the 10 year Project life, it was determined the probability of exceedence is 9.5 percent. Peak horizontal seismic acceleration was determined to be 0.078 gravity (g).

For structures with a significant hazard rating, such as the heap leach and tailings facilities, a return period of 475 years was used. The probability of exceedence is 2.1 percent over the Project life. The peak horizontal seismic acceleration would be 0.144 g.

The indirect effects of an earthquake include liquefaction, subsidence, and landslide activity. The potential for liquefaction is low or non-existent for an area, such as the Project site, with shallow bedrock and deep groundwater. However, seismic-induced tailings liquefaction is possible. The stability of the tailings embankment was evaluated by KP for the case of seismically-induced tailings liquefaction. The results of the analyses prove non-critical. Basin subsidence is not likely at the Project site. Induced landsliding from seismic activity is possible on steep slopes. However, facilities that hold or impound potentially hazardous substances are located far enough away from upland slopes to preclude damage from landsliding.

All buildings and structural components on the site, including those for containment of hazardous materials, were designed according to Lassen County and Uniform Building Code requirements and standards. Seismic analyses for structures with both low risk and significant hazard ratings were conducted for the Project site as described above. Facilities such as the waste rock dump, heap leach pad and tailings impoundment were designed accordingly. The stability of the tailings embankment was evaluated for seismically-induced tailings liquefaction. Although it is possible for a seismic event to occur at the site, the potential for damage to a facility and release of a hazardous material is mitigated through engineering design. No other mitigation measures are necessary. Potential direct and indirect adverse impacts to the site due to seismic events are not significant.

Hazards due to unstable earth conditions - Alterations in topography at the Project site will occur as a result of the Proposed Action. There is a potential for erosion, slope failure, and slumping on such facilities as the waste rock dump, heap leach, and tailings impoundment. Highwalls in the pit would be subject to erosion which could cause instability and failure. Failure from these facilities could cause hazards to employees and authorized visitors to the site, resulting in direct short-term, adverse impacts. These same facilities could also present hazards to recreationists and visitors to the site after Project completion, resulting in direct long-term, adverse impacts.

Short-term adverse impacts would be mitigated through proper engineering design and construction of the pit, waste rock dump, heap leach, and tailings impoundment. The waste rock dump is anticipated to be stable with an overall slope of 3H:1V. It will be end dumped, by truck, directly from the pit at the angle of repose, estimated to be 1.3H:1V. Benches will be formed, as the dumping proceeds, in 100 foot (vertical) intervals to effect the overall 3H:1V slope. The heap will be built by conveyor loading the ore at the angle of repose, estimated to be approximately 1.5H:1V. Lift heights are anticipated to be 8 to 20 feet, with the total height of the heap proposed to be 120 feet. The slopes of the 131 acre tailings impoundment will be reclaimed concurrently with construction, and the slopes seeded with a mixture specially designed for quick stabilization of the soil. The pit has been designed to surface mining industry standards, with 45-degree pit slopes and 20-foot high benches. Actual pit slopes and bench heights will be determined by on-site rock mechanic testing, performed concurrently with operations, to ensure maximum pit stability and safety.

With the above mitigation, the potential for short-term adverse impacts to human safety due to slope failure will be eliminated. These impacts are not considered significant.

Long-term adverse impacts would be mitigated by reclamation procedures. A site-specific Reclamation Plan has been developed for the Project (Appendix E). The reclamation procedures proposed for the Project incorporate four basic components (Reclamation Plan, Section 4.4). Two of these components involve the establishment of surface soil conditions conducive to the establishment of a stable plant community, and revegetation of disturbed areas. The other two components are listed below:

- Establishment of stable surface, topographic, and drainage conditions that are compatible with the surrounding landscape and serve to control erosion; and

- Consideration of public safety through the stabilization, removal, and/or fencing of structures or land forms that could constitute a public hazard.

The post reclamation contouring for the site has been designed for the control of erosion and sediment, and stability of structures, with the post-mining land use in mind. Impacts caused by erosion and sedimentation due to modifications in topography are discussed in Section 4.2.3, Soils.

Approximate post reclamation contours of the Project site are shown on Figure 2.2-8. In most cases, slopes will be shaped for reclamation during the material placement or removal. Depending on the type of material, erodability, and the practical considerations of the mining process, overall slope grades will range from 1H:1V to near flat. Final grading of cuts and fills in unconsolidated material will create stable landforms with overall slopes not greater than 2.5H:1V.

Upon final cessation of mining, the pit will be surrounded with a berm and posted with appropriate warning signs. Unstable pit highwalls will be brought down with explosives, while those areas which are stable and suitable for raptor nesting will be left in place. With the utilization of these mitigation measures, possible long-term adverse impacts caused by instability of pit highwalls are not significant. In addition, newly created outcrops in the pits, i.e. the pit walls, could be viewed as an indirect and direct, long-term, beneficial impact. The outcrops would provide surfaces for sampling and mapping by geologists. Such studies could result in discovery of additional mineral resources adjacent to and underlying the pits.

The waste rock dump is designed for long-term stability with an overall slope of 3H:1V. At closure, the benches will be covered with topsoil and seeded. During reclamation, the 199 acre heap will be contoured and physically manipulated for stabilization, to control drainage, and to prevent surface ponding. The slopes of the heap will be pushed out to a slope of 2H:1V, and will receive a seed mixture specifically designed to quickly stabilize the slopes. The slopes of the 131 acre tailings impoundment will be reclaimed concurrently with construction. The slopes will be seeded with a mixture specially designed for quick stabilization of the soil. With the planned mitigation, potential long-term adverse impacts caused by slumping and slope failure of these facilities will be eliminated. These impacts are not considered significant.

4.2.2.3 Mitigation Measures for Topography and Geology

Topography

Long-term changes in topography due to proposed Project activities cannot be entirely eliminated. However, impacts to topography due to the Proposed Action will be mitigated to some extent through

Project design and reclamation procedures as described above. No other mitigation measures are proposed.

The long-term adverse impact due to the construction of the open pit cannot be mitigated.

Geology

Although the possibility does exist for a seismic event to occur at the site, the potential for damage to a facility or release of a hazardous material is mitigated through engineering design. No other mitigation measures are necessary.

The occurrence or creation of public hazards will be mitigated through Project engineering design and through planned site-specific reclamation procedures. No other mitigation measures are necessary.

4.2.2.4 Unavoidable Adverse Impacts

The modification of Hayden Hill due to the development of the open pit would introduce an unnatural landform to the area. This would result in a direct, long-term adverse impact to topography which cannot be mitigated. No other unavoidable adverse impacts were identified for geology and topography.

4.2.2.5 Cumulative Impacts

No significant cumulative impacts have been identified for geology and topography.

4.2.3 Soils

4.2.3.1 Issues, Concerns, and Opportunities

The issues and concerns related to soils are listed below:

1. Will there be a soil salvage plan and if so what will it entail?

2. How will erosion control be achieved at the site?

Issue 1 is addressed in Chapter 2.0, Section 2.2.2.2. Soil salvage is planned and estimates indicate enough soil can be salvaged to replace approximately 12-inches over all excavated areas under the Proposed Action.

Issue 2 is a complex matter. Discussions on this subject are found in Sections 4.4.3 and 4.4.4 of the Reclamation Plan and in this section as well as under the vegetation and water resources sections of this document.

4.2.3.2 Soil Resource Impact Analysis

The potential impacts of the Project on the soil resource is evaluated for each alternative by:

- Determining the acreage of each soil taxon to be disturbed or excavated;
- Determining the volumes of growth media available for reclamation; and
- Comparing in-place soils to be disturbed or excavated in terms of available water-holding capacity, erosion hazard rating (wind, sheet and rill), and hydrologic soil grouping.

In this section Project impacts are described exclusive of mitigation. The effects of mitigation measures to reduce anticipated impacts are described for the Proposed Action in Section 4.2.3.3, Mitigation Measures for Soil Resource Impacts.

Soil Resource Impacts

Impact areas for soil resources within the site boundary, wellfield corridors, access road corridor, and power line corridor are shown in Figures 3.3-1 and 3.3-2. The impact areas for soil resources within the wellfield corridors are limited to a 10-foot width along each side of the existing roadways. The impact area for soil resources within the power line corridor is limited to a 20-foot width along the east side of Highway 139 and is limited to the access road corridor within the site boundary.

The impact area for soils also includes three 40-foot by 40-foot drill pads within each wellfield corridor. Two of these pads are already in place in the Bunselmeier Spring and Preston Canyon corridors. The precise locations of the remaining four pads are presently unknown and will be determined during construction.

For purposes of environmental analyses, soils within the impact area are placed into one of two categories: "disturbed" or "excavated". Disturbed soils will be significantly altered by activities such as filling and grading, but to some degree will remain in place. Topsoil from disturbed soils will not require salvage. Disturbed soils occupy the haul road and access road locations, growth media stockpile locations, wellfield corridors, and power line corridor.

Excavated soils occupy all other locations that will be impacted by excavation, burial, or otherwise developed. For excavated soils, all soil horizons of a 12-inch thickness or greater, that are determined to be suitable growth media material, will be selectively removed and transported for temporary storage or permanent placement elsewhere. Excavated soils occur at the locations of the waste rock dump, mine pit, heap leach pad, administration building, crushing and milling facilities, tailings pond and other impoundments.

Acreages of disturbed and excavated soils within the impact area for the Proposed Action are summarized in Table 4.3-1. While the precise locations of the drill pads are not known, the area of soil types underlying the drill pads has been estimated based upon the distribution of soil types within the wellfield corridors.

As shown on Table 4.3-1, the impact areas for soil resources total approximately 950 acres. About 805 acres of this total are classified as excavated soil. The remainder, approximately 145 acres, are classified as disturbed soils.

Soils within the impact area, exclusive of the power line corridor, are characterized in Table 4.3-2 in terms of their suitabilities as sources of growth media, available water-holding capacities (AWC), erosion hazard rating (sheet, rill, and wind), and hydrologic soil groupings. Criteria for assessing growth media suitability are those of the Wyoming Department of Environmental Quality and are presented in Table 4.3-3. Note that horizon thickness is not a criterion for growth media suitability under the Wyoming guidelines, but that soil horizons must be a minimum of 12-inches thick to be realistically salvaged.

Estimated volumes of useable growth media for soil horizons greater than 12-inches thick are presented in Table 4.3-4 for each project component where excavated soils occur. As shown in Table 4.3-4, approximately 2,261,220 cubic yards of useable growth media occur in these areas. Comparison of the suitability interpretations presented in Table 4.3-3 with Table 4.3-4 indicate that about 1,124,439 cubic yards of the suitable growth media - or about 50 percent of the total volume available - is classified as "poorly suited" according to the Wyoming criteria. The most common limitation to topsoil suitability is the excessive coarse fragment content which reduces available water-holding capacity and inhibits root development. Approximately 1,298,700 cubic yards of growth media will be required for replacement on the 805 acres of excavated soil. Very little of this unsuitable soils would be required because not all of the 805 acres will be accessible.

As shown in Table 4.3-2, for most soils in the impact areas the available water-holding capacity within the 60-inch soil profile, or to bedrock or hardpan, is less than 5 inches. This value is considered low. Generally, soil water-holding capacity will be reduced by "disturbance-type activities" and eliminated by "excavation-type actives". These reductions of soil water-holding capacities below present values may

TABLE 4.3-1

ACREAGES OF SOILS TO BE DISTURBED OR EXCAVATED

Soil Taxon	Disturbed Acreage		
	Roads, Corridors	Topsoil Stockpiles	Excavated Acreage
Brisco cb-1	15.8	5.3	140.6
Erig vst-1	3.0	0.2	134.9
Erig st-1	0	0.5	54.6
Ricketts gr-1	9.8	7.0	97.6
Orhood gr-1	0	0	0
Unnamed loam	1.8	0	9.5
Jellycamp gr-1	6.9	0	297.3
Vansickle vcb-1	5.1	9.0	8.2
Patburn loam	0.6	0	17.7
Patburn loam, eroded	0.1	0	4.1
Floodplain si-1	4.2	0	6.5
Hydric si-1	0.9	0	0
Fiddler gr-1	12.7	0	10.9
Deven variant loam	10.2	0	1.9
Searvar cobbly loam	0	0	0
Dotta gr-1	1.0	0	21.0
Adinot vcb-sl	0.7	0	0
Adinot vgr-sl	4.3	0	0
Adinot vgr-sl, eroded	2.6	0	0
Adinot vst-1	1.9	0	0
Dotta sl	1.1	0	0
Bieber gr-sl	4.5	0	0
Modoc sl	2.6	0	0
Oxendine ex gr sl	3.0	0	0
Sweagert loam	1.7	0	0
Molina ex gr sl	12.9	0	0
Henhill sil	2.8	0	0
Pastolla mucky silt	0.2	0	0

TABLE 4.3-1

ACREAGES OF SOILS TO BE DISTURBED OR EXCAVATED (continued)

Soil Taxon	Disturbed Acreage Roads, Corridors	 Topsoil Stockpiles	Excavated Acreage
Jellycamp vcb-1	1.1	0	0
Splawn vcb-1	0.9	0	0
Ollierivas 1	0.9	0	0
Packwood family	2.2	0	0
Bieber family	1.9	0	0
Gwinn family	2.2	0	0
Pass Canyon family	0.9	0	0
Lithic Xerorthents, mesic	0.9	0	0
Lithic Xerorthents, mesic	0.2	0	0
Xerofluvents, mesic	0.2	0	0
Aquolls	0.2	0	0
Devon family	0.4	0	0
Pass Canyon family	0.2	0	0
Keating family	0.2	0	0
Total	122.8	22.0	949.6

As shown in Table 4.3-2, for most soils in the impact areas the available water-holding capacity within the 60-inch soil profile, or to bedrock or hardpan, is less than 5 inches. This value is considered low. Generally, soil water-holding capacity will be reduced by "disturbance-type activities" and eliminated by "excavation-type actives". These reductions of soil water-holding capacities below present values may adversely affect the regeneration of perennial or native plant communities, particularly on warmer (south and west-facing) aspects.

Water erosion hazard ratings presented in Table 4.3-2 are for in-situ soils and address sheet and rill erosion. The hazard rating is low for 12 of the 16 soils rated and moderate for the remaining 4 soils. For soils with a low erosion hazard rating, accelerated erosion is not likely to occur following removal of vegetation and minor disturbance, except during periods of above-average storm occurrence. Accelerated erosion is likely to occur following minor disturbance to soils with a moderate erosion hazard rating.

The Proposed Action will increase the water erosion hazard rating, or erosion potential, of disturbed soils within the impact area due to removal of vegetation, reduction of soil intake rates and permeability, increased run-off (described below), and increased potential for water concentration. The erosion potential of excavated and stockpiled soils will also be increased for most of the same reasons as well as due to the destruction of soil structure.

Wind hazard ratings presented in Table 4.3-2 are based on Soil Conservation Service (SCS) methodology. The Proposed Action will have little effect on the hazard of wind erosion because of the homogeneity of soil textures throughout the impact area. Nonetheless, the Proposed Action is expected to cause some increase in wind erosion due to the removal of vegetation, increased slope length and destruction of soil structure in surface horizons.

The slopes between the benches on the waste rock dump will not be reclaimed. The waste rock will be composed of large blocks of rock containing little fine material that could contribute to wind erosion. Results of computer modelling (Section 4.2.6.5) indicate run-off and sediment yield from the waste rock dump are decreased by the presence of benches, and the magnitude of difference in run-off and sediment induced by the mine is not significant in terms of cumulative impacts to Willow Creek. Wind and water erosion from sloped areas between the benches on the waste rock dump is not expected to be significant.

The Proposed Action includes operating the mine year around. If Best Management Practices (BMPs) are not followed, the timing of earthwork, particularly vegetation removal and excavation, strongly influences the hazard of erosion. Earthwork performed between mid-October and mid-April results in larger amounts of water erosion and soil compaction than work performed during drier seasons. Work performed in drier months results in increased wind erosion.

TABLE 4.3-2

PRE-DISTURBANCE SOIL MANAGEMENT INTERPRETATIONS

Map Unit Component	AWC		Erosion Hazard		Hydrologic Soil Group	Stability for Topsoil (inches, suitability rating)
	0-6 (inches)	0-40 (inches)	Water	Wind		
Brisco cobbly loam	0.8	4.8	Low	Mod	B	0-44 Poor
Erig very stony loam	0.7	4.4	Mod	Mod	B	18-32 Poor/0-18, 32-42 Unsuited
Erig stony loam	0.7	4.4	Low	Mod	B	18-32 Poor/0-18, 32-42 Unsuited
Ricketts gravelly loam	0.8	4.3	Low	Mod	B	0-36 Good
Orhood gravelly loam	0.9	2.4	Low	Mod	D	0-10 Good/10-20 Unsuited
Unnamed loam	1.0	6.3	Mod	Mod	B	0-36 Good/36-60 Fair
Jellycamp gravelly loam	0.8	1.9	Low	Mod	D	0-9 Good/9-14 Fair
Vansickle very cobbly loam	0.8	1.4	Low	Mod	D	0-12 Fair
Patburn loam	0.9	3.6	Low	Mod	B	0-9 Good/9-30 Fair
Patburn loam eroded	0.9	3.6	Low	Mod	B	0-9 Good/9-30 Fair
Floodplain silt loam	1.0	6.1	Low	Mod	B	0-24 Good/24-60 Fair
Hydric silt loam	1.0	6.8	Low	Mod	B	0-24 Good/24-60 Fair
Fiddler gravelly loam	0.8	3.32	Low	Mod	B	0-12 Good/12-24 Fair/24-28 Unsuited
Deven vanant loam	1.0	1.5	Mod	Mod	D	0-10 Good
Searvar cobbly loam	0.8	3.8	Low	Mod	B	0-32 Fair
Dotta gravelly loam	0.9	6.3	Low	Mod	B	0-12 Good/12-48 Fair

TABLE 4.3-3

CRITERIA FOR ASSESSING GROWTH MEDIA SUITABILITY

Parameter	Good	Fair	Poor	Unsuitable
pH	6.0-8.4	5.5-6.0 8.4-8.8	5.0-5.5 8.8-9.0	<5.0 >9.0
EC (Conductivity mmhos/cm)	0-4	4-8	8-16 >8 may prove difficult to revegetate	>16
Saturation Percentage		25-80	>80 <25	
Texture	sl, l, sil, scl, vfsl, fsl	cl, sicl, sc, ls, lfs	c, sic, s	
SAR	<6	6-10	10-15 10-12[a]	>15 >12[a]
Selenium		<2.0 ppm		>2.0 ppm
Boron		<5.0 ppm		>5.0 ppm
Calcium Carbonate	0-15%	15-30%	over 30%	
Coarse 3-10 inch fragments (% vol)	0-15	15-25	25-35	>35
> 10 inch	0-3	3-7	7-10	>10
Moist Consistence	vfr, fr	lp, fi	vfi, exfi	
Dry Consistence	lo, so	sh, h	vh	

Source: Wyoming Department of Environmental Quality (1981).
For fine texture soils (Clay > 40%).

TABLE 4.3-4

VOLUMES OF USEABLE GROWTH MEDIA BY PROJECT COMPONENT
(Excavated Acreages Only)

Soil Taxon	Dump (acres)	Pit (acres)	Leach Pad (acres)	Tailings Pond (acres)	Other[1] (acres)	Total Soil Taxon (acres)	Useable Soil (Inches[2])	Useable Soil Volume (cu-yd)	Suitability for Topsoil
Brisco cb-l	120.7	11.6	0	0	0	132.3	0-44	782,628	P
Erig vst-1	48.2	82.9	0	0	0.4	131.5	18-32	246,759	P
Erig st-1	4.9	45.6	0	0	0	50.5	18-32	95,052	P
Rickets gr-1	12.8	15.6	8.4	0	20	56.8	0-36	274,912	G
Unnamed loam	3.5	0	0	0	0	3.5	0-60	28,233	16,940G 11,293F
Jellycamp gr-1[2]	0	0	150.1	113.4	32.7	296.2	0-14	557,514	358,394G 199,120F
Vansickle vcb-1	0	0	0	2.6	5.6	8.2	0-12	13,229	F
Patburn loam	0	0	9.4	5.4	2.9	17.7	0-30	71,390	21,460G 49,930F
Patburn loam eroded	0	0	4.0	0	0	4.0	0-30	16,133	4,806G 11,327F
Floodplain sil	0.7	0	0	0	0	0.7	0-60	5,647	2,283G 3,364F
Fiddler gr-1	10.8	0	0	0	0	10.8	0-24	34,848	17,424G 17,424F
Deven variant 1	1.8	0	0	0	0	1.8	0-10	3	
Dotta gr-1	0	0	0	0	20.9	20.9	0-48	134,875	33,719G 101,156F
Total	203.4	155.7	171.9	121.4	82.5			2,261,223	

[1] Other category includes buildings, shops, process facilities, solution ponds, detention ponds, and other impoundments.
[2] Useable soil as defined in Wyoming Department of Environmental Quality Criteria (Table E).
[3] Volumes not calculated for soil horizons less than 12-inches thick.

Hydrologic soil groupings are aggregations of soils having the same run-off potentials under similar storm and cover conditions. As shown in Table 4.3-2, soils in the impact area are included in hydrologic soil groups "B" or "D". The SCS identifies soils in group "B" as having moderate rates of water transmission and moderate run-off potentials. Soils in group "D" have very slow rates of water transmission and high run-off potentials.

The Proposed Action will tend to decrease the rate of water transmission and increase the run-off potential of soils affected by disturbance-type activities due to compaction, reduction of soil depth, and reduction of the infiltrative surface. The rate of water transmission will increase and the run-off potential will be reduced for excavated and stockpiled soils.

Physical and chemical characteristics of the soils in the impact area will become more homogeneous as a result of stripping, mixing, scraping, grading, and placement activities. One effect of this increase in soil homogeneity may be to remove the advantage that certain plant species have over other, less specialized species. For example, a shallow silica-indurated hardpan (i.e. duripan) occurs over about 380 acres of the approximately 950-acre soil resource impact area. The Deven Variant soil is shallow to bedrock and occupies an additional 31 acres. The Low Sagebrush vegetation type, which includes *Antennaria* species, correlates roughly to these and other shallow, gently undulating to rolling soilscapes. The Low Sagebrush vegetation type may be difficult to re-establish in these areas following destruction of the duripan and excavation of shallow bedrock because of increased competition from species that had been excluded due to shallow soils.

In addition, the Jeffrey Pine/Mountain Shrub vegetation type requires a deep, well developed, drained soil to produce commercial quality timber stands. The reclaimed soils will be a maximum of 12-inches deep. It is unlikely that the current timber stand quality can be reproduced (Farschon 1991b).

The productivity of stockpiled growth media may be diminished due to the reduction in rate of decomposition of organic matter caused by declining microbial activity while in storage.

4.2.3.3 Mitigation Measures for Impacts to Soil Resources

In regard to the increased wind and water erosion potential of the approximately 805 acres of soil to be excavated or buried and the approximately 145 acres of soil to be disturbed:

- The Reclamation Plan shall include a detailed, site specific, and comprehensive soil erosion control plan. The soil erosion control plan shall address wind and water erosion, short-term and long-term impacts, and timing of reclamation activities. Included in the soil erosion control plan shall be plans and specifications for erosion control structures and prescriptions sufficiently detailed to permit pre-construction review and post-construction inspection. (The revised Reclamation Plan, included in Appendix E, contains a soil and erosion control plan.)

In regard to the remote possibility of insufficient growth media reserves to meet the 12-inch replacement goal:

- Wherever practicable, soil which does not meet growth media suitability criteria will also be salvaged for use as substrate material during growth media placement. Wherever practicable, soil materials (subsoils) that meet growth media suitability criteria will be salvaged for use as growth media.

- Wherever practicable, reclaimed surfaces shall be brought to within 12 inches of final grade using substrate material consisting of soil that does not meet growth media suitability criteria. A minimum of 12 inches of growth media shall be placed on all reclaimed surfaces where topsoil was removed or buried including the locations of the dump, pit, heap leach pad, impoundments, and structures. Growth media shall be placed on roughened surfaces to increase contact surface area and will be lightly compacted to enhance water retention and to reduce erosion. Vegetative cover will be established immediately following placement of growth media.

In regard to the loss of productivity which may result by stockpiling the growth media:

- Growth media stockpile sideslopes will not exceed 3H:1V. Ditching will be placed around stockpiles to minimize run-on. A vegetative cover including legumes shall be established on the stockpiles immediately following their placement. Stockpiles left in place longer than three years will be monitored to determine whether soil amendments, fertilizer, or inoculation with vesicular arbuscular mycorrhizae are required to restore growth media productivity. Heavy equipment will be excluded from the stockpile area unless directly involved in placing, transporting, or shaping the pile. (The revised Reclamation Plan, Appendix E, includes stockpiling growth media in this manner.)

In regard to the difficulty of reclaiming homogenized soils which may differ significantly from the soils supporting the existing vegetation:

- Field trials shall be established at the beginning of mining to determine the reclamation management requirements of each growth media type. Field trials shall also be conducted to develop techniques to minimize adverse effects of destroying the duripan for reestablishment of the Low Sagebrush vegetation type. (The revised Reclamation Plan, Appendix E, includes field trials for these purposes.)

4.2.3.4 Unavoidable Adverse Impacts to the Soil Resource

Unavoidable adverse impacts to the soil resource include the following:

- The loss of 296 acres of timber-producing soil at the pit and waste rock dump locations cannot be mitigated sufficiently to insure timber production. This represents a long-term, unavoidable adverse impact. However, the acreages are small compared to those available and this impact is not considered significant.

- The destruction of soil duripans over about 380 acres that includes the approximately 355 acres of Low Sagebrush vegetation type and associated habitat will constitute a long-term, adverse impact. The loss of the habitat values to this vegetation type will be mitigated by the protection of an equal amount of duripan soils adjacent to the Project (Appendix I). This impact to the soil resource is not considered significant.

- The increased potential for water erosion and sedimentation is a short-term adverse impact. This impact can be mitigated by the addition of a sediment and erosion control plan to the Reclamation Plan, and is not considered significant.

4.2.3.5 Cumulative Impacts

Approximately 105 acres of commercial timber land will be lost due to soil removal and burial. The Jeffrey Pine/Mountain Shrub vegetation type requires a deep, well developed, drained soil to produce commercial quality timber stands. The reclaimed soils will be a maximum of 12-inches deep. It is unlikely that the current timber stand quality can be reproduced.

Other commercial timber areas in the vicinity of the Project are being considered for sale. However, there are no other projects or activities in the area now or in the foreseeable future which would remove timber lands from future production. Therefore, the lost timber-producing soils are considered a direct impact of the Project and not a cumulative impact. No other cumulative impacts were identified for soils.

4.2.4 Vegetation

4.2.4.1 Issues, Concerns, and Opportunities

Issues and concerns related to vegetation, wetlands, reclamation and long term productivity are listed below:

1. What vegetational resource values are present and how will they be protected?

2. Will water courses, riparian areas, and wetland areas be delineated, and will adequate mitigation measures and compensation be developed?

3. What old growth forest areas exist at the site?

4. Will the Project affect any protected State or Federal plant species?

5. What are the reclamation objectives for the areas of influence?

6. How will the Project components be reclaimed and waste material be managed following Project completion?

7. Will the reclamation bond be adequate to cover reclamation and long term monitoring?

8. Will soil mapping, re-vegetation trials, and site specific erosion control measures be carried out to evaluate Project impacts and develop the reclamation plan?

9. How will re-vegetation success be monitored?

In regard to Issues 1 and 2, the vegetation resources were described in Section 3.4 of the previous chapter. How these resources will be protected, mitigated and compensated will be discussed in this section. In regard to Issue 3, no old growth forest was identified at the site. Issue 4, regarding protected species, is discussed in Section 3.4.1 of the previous chapter. The reclamation objectives for the areas of influence and how these areas will be reclaimed, Issues 5 and 6, are summarized in Section 2.2.11 of Chapter 2.0 and presented in more depth in the Reclamation Plan, which is included in Appendix E. In regard to Issue 7, the reclamation bond, the Reclamation Plan has been revised in response to the comments received from the Draft EIR/EIS. The reclamation bond has been recalculated to reflect these changes and to include all aspects of reclamation. In regard to Issue 8, field trials are a part of the Reclamation Plan. These trials will include tests of species and specific erosion control techniques to be used on site. The Reclamation Plan indicates these trials will be used to modify the specifics of the Reclamation Plan. How re-vegetation success will be monitored, Issue 9, is presented in the revised Reclamation Plan and discussed in this section.

4.2.4.2 Plant Community Impact

Impacts to vegetation expected from the Proposed Action and evaluated in this section include: Removal of portions of the existing vegetational communities; potential for removal of individuals of special status in the State of California; and the potential for establishment of weed species in disturbed areas.

Impacts to vegetation are considered potentially adverse if they could; substantially affect a special status species or its habitat, substantially diminish habitat for a plant species or vegetation type, or, pose a potential for unacceptable weed encroachment.

Assumptions

The following impact analysis assumes the items listed below, mentioned in the Applicant's Plan of Operations and Reclamation Plan, will occur.

- The pit will have select benches (as shown in the Reclamation Plan) and flat areas covered with growth media as available to a depth of 12 inches and be re-vegetated.
- Sufficient growth media will be available to cover all areas to be reclaimed to a depth of 12 inches.
- Spacing of poles for the power line will avoid and span all wetland areas.
- All components of the Reclamation Plan will be carried out.

Impacts

The proposed Project would impact vegetation primarily through the direct removal of plants for facilities construction. Potential impacts to the vegetation types on the Project site are shown on Figure 3.4-1, the vegetation map. Approximately 950 acres of various vegetation types are expected to be lost to the Project facilities, including; the pit, waste rock dump, growth media stockpiles, facilities, mill/processing complex, heap leach pad, solution ponds, administration building, roads and utility right-of-ways (ROW). Disturbances to ROWs include the installation of pipelines to Bunselmeier Spring and Preston Canyon (linking the water source with the Project) and the upgrading of the access road. The pipelines will be laid within current dirt road alignments or alongside the existing road where possible. Where this is not possible, the disturbances will be no greater than 20-feet wide. Total disturbance will not exceed 20-feet wide along the length of the corridors. A disturbance of 10 acres is expected along the Bunselmeier Spring corridor and a disturbance of 12 acres is expected along the Preston Canyon corridor. These disturbance figures include area for two additional wells drilled in each corridor. The access road improvements will use the existing Hayden Hill Road alignment and new disturbance will be limited to the uphill side of the road where possible. The impacted areas in which total removal of the growth media is necessary may be more difficult to reclaim than those areas where the soil is left intact. Areas where the soil will remain but vegetation disturbance will occur are beneath the growth media stockpiles,and along the well field corridors and the power line corridor. The remaining areas of impact will require complete soil removal. The Reclamation Plan includes stockpiling suitable growth media and replacing it prior to re-vegetation. Growth media will be separated by vegetation type. It is anticipated there will be sufficient growth media for a 12-inch lift over all disturbed areas. On-site research with re-vegetation techniques and plant material are planned to provide data necessary to enhance the Reclamation Plan. Given these items, the chances for successful reclamation of the disturbed areas which are to be re-vegetated are good. Specific impacts by vegetation type are discussed below.

Low Sagebrush

Portions of the mine facilities, including part of the heap leach pad, the access road, Bunselmeier Spring and Preston Canyon pipelines, power corridor, solution ponds, tailings disposal area, mill/processing facilities, growth media stockpiles, haul roads and the administration building will be located in Low Sagebrush vegetation. The disturbance to this vegetation type is estimated at 355 acres, approximately 58 percent of the Low Sagebrush vegetation within the site boundary. Low Sagebrush vegetation is also common within the Modoc National Forest (MNF). The Low Sagebrush vegetation is adapted to local duripan soils common to this area. Once the duripan soils are disturbed, it is unlikely the vegetation re-established on the new soils will be identical to the existing Low Sagebrush vegetation. The habitat values of this vegetation type are dependant on the return of a vegetation type with similar height and architecture to that existing. Since this is not likely the impact is long-term. Re-topsoiling and seeding of these areas, however, is expected to result in near complete re-vegetation, therefore, the cover disturbances in this vegetation type are considered short-term. Wind erosion could occur during the time this vegetation type is disturbed. Erosion from precipitation could also occur, however, the gradient in the area where this vegetation type is common is low. The Reclamation Plan includes a detailed soil erosion control plan. The impact to the cover values of the Low Sagebrush vegetation will be short-term while the impact to habitat values will be long-term. The loss of the habitat values to this vegetation type will be mitigated by the protection of an equal amount of similar vegetation adjacent to the Project (Appendix I).

Upland Shrub

Portions of the mine pit, waste rock dump, access road, processing facilities, Preston Canyon pipeline, power corridor, heap leach pad, one growth media stockpile and haul roads will cause the removal of approximately 244 acres of Upland Shrub vegetation. Approximately 210 acres will be reclaimed. The unreclaimed portions will be the steep slopes of the pit and waste rock dump. This is approximately 38 percent of the Upland Shrub vegetation within the site boundary. The Upland Shrub vegetation type is also common within the MNF and within the site boundary. The flat and gently sloping portions of the pit and waste rock dump will be re-topsoiled and seeded following mining activities. The heap leach pad and other disturbances will be re-topsoiled and seeded. The natural re-vegetation success evident on the abandoned heap leach pad indicates reclamation can be effective in this area.

The Upland Shrub vegetation type is commonly found on steeply sloping land. A potential for erosion by wind and precipitation exists during the time the vegetation is stripped from these areas. If proper erosion control measures are not followed, additional impacts could occur to surrounding vegetation, surface water and air quality. The detailed soil erosion control plan, included in the Reclamation Plan would negate this potential impact.

As proposed, the Project presents a short-term impact to the Upland Shrub vegetational cover and corresponding habitat values for the 210 acres to be reclaimed. It is expected the reclamation activities will return the habitat value in a relatively short time. The 34 acres of Upland Shrub vegetation of the pit and waste rock dump which will not be re-vegetated will remain as a long-term impact until natural invasion occurs.

Jeffrey Pine/Mountain Shrub

The waste rock dump will require the removal of approximately 175 acres of Jeffrey Pine/Mountain Shrub vegetation. The Hayden Hill access road, pit, Bunselmeier Spring and Preston Canyon corridors, Power Line corridor, some haul roads and the growth media stockpiles will impact approximately 121 acres of this vegetation type. A total of 296 acres, of this vegetation type, will ultimately be disturbed. Of this disturbance, 194 acres will be reclaimed. The unreclaimed portion, 102 acres of the steep slopes of the pit and waste rock dump, will constitute a long-term impact for cover and habitat values. The loss of the habitat values of this vegetation type will be mitigated by the protection of 230 acres of similar habitat adjacent to the Project site (Appendix I).

Approximately 31 percent of the Jeffrey Pine/Mountain Shrub vegetation within the site boundary will be impacted. This vegetation type is common in the MNF. Though it will take several years to develop, the loss of the cover value of 194 acres of this vegetation will be temporary as the Reclamation Plan includes re-topsoiling and seeding the benches of the waste rock dump area upon mine closure. Reclamation is expected to return the cover value of this area. Since the cover value of the reclaimed Jeffrey Pine/Mountain Shrub vegetation type will eventually return, this impact is considered short-term.

The habitat value of the 194 acres of reclaimed Jeffrey Pine/Mountain Shrub vegetation is dependent on the re-establishment of the Jeffrey pine forest. This will take more than 10 years to develop naturally. The loss of the habitat value will, therefore, be a long-term impact. However, 230 acres of this vegetation type will be protected adjacent to the Project site for habitat use by any displaced wildlife (Appendix I).

This vegetation type includes the commercial timber resource on site (forests producing 20 cubic feet of timber per acre per year). Approximately 105 acres of the Jeffrey Pine/Mountain Shrub vegetation which is impacted by the Project occurs on USFS and BLM land and may be of commercial timber land quality. Reclamation and natural reforestation are unlikely, at best, to reproduce a commercial timber stand in the near future (Farschon 1991b). This impact is long-term.

The steep slopes present within this vegetation type will be exposed to increased erosion potential from wind and precipitation while the area is stripped. Proper erosion control will be necessary to protect lower lying vegetation, surface water and air quality from transient materials. If reclamation does not immediately follow the placement of the growth media, the erosion potential will increase due to the higher erodability of the growth media material. The Reclamation Plan includes an erosion control plan which specifically addresses these concerns. With its implementation, erosion should not constitute a significant impact.

Grassland

Approximately 13 acres of planted pasture Grassland vegetation would be impacted by the heap leach pad. The Reclamation Plan is expected to replace vegetation comparable to this dry grassland. The impact as a result of this loss is considered short-term for both cover and habitat values.

Approximately 35 acres of native grassland vegetation would be impacted by the heap leach pad, tailings pond, access road, processing facilities, Preston Canyon and Bunselmeier Corridors, and the power line. Re-vegetation including topsoiling is planned for all of the disturbed native grassland vegetation. The impact to the cover value of this vegetation type is considered short-term. The impact to the habitat value is considered long-term. Approximately 35 to 40 acres of lush meadow will be protected and maintained adjacent to the Project to offset the lost habitat values (Appendix I).

Wetlands

The potential impacts of the Project on wetland resources is evaluated for the Proposed Action and for each alternative by determining the presence or absence of wetlands within impact areas.

No wetlands occur within the open pit. However, because the elevation of the bottom of the final pit will be about 5,400-feet above mean sea level (msl), about 900-feet below the present summit of Hayden Hill, excavation of the pit may alter the geohydrology beyond the limits of the pit itself. Seeps located approximately 1,200-feet southwest of the pit at about 5,720-feet msl, and seeps located 6,700-feet southeast of the pit at approximately 5,760-feet msl may be affected by the excavation.

Construction of the heap leach pad complex will require placement of fill in all or parts of the following wetlands: The mine detention ponds and other wetlands located in the northwest quarter of the northeast quarter of Section 1; the mine detention pond located in the northwest quarter of the southeast quarter of Section 1; and the seep located immediately north of the road intersection in the southeast quarter of the northeast quarter of Section 1.

Permanent stream channels would be impacted by the widening of the intersection at Highway 139 and Hayden Hill Road (60 feet) and by the crossing on the Indian Spring Creek in the southwest quarter of Section 32 (20 feet). The impact to permanent streams totals approximately 80 lineal feet. The stream banks in this area are very steep and the wetlands associated with the impacted stream channels are limited to the area covered by the high water mark. Willow Creek is approximately 10 feet wide at this point, while Indian Spring Creek is approximately two feet wide.

Intermittent stream channels would be impacted by the west side of the waste rock dump (1,305 feet) and one crossing along the access road (10 feet). The impact to intermittent streams totals 1,315 lineal feet. Intermittent stream wetlands are limited to the high water area during flows. On average, the wetland area is approximately one to two feet wide, with no associated wetland vegetation.

The Plant and Animal Survey of the Willow Creek Power Line Corridor (Bio-Resources 1990d) did not identify wetlands along this power line corridor but did recognize the occurrence of drainages and hydrophytic vegetation in the area. Bio-Resources dismisses the possibility of impacts to these areas by the placement of poles and ability to span wetland areas. The impacts to the power corridor wetlands are considered insignificant given the possibility of spanning the wetland areas.

A total of 6.55 acres of wetlands, 80 lineal feet of permanent stream channel and 1,315 lineal feet of intermittent stream channel (approximately 0.07 acre) will be impacted by implementing the Proposed Action. These impacts are considered long-term for habitat value and short-term for cover value since reclamation would include these areas. A mitigation plan for impacts to wetlands has been prepared by the Applicant in conjunction with the Corps of Engineers 404 Permit. This mitigation plan replaces the impacted wetlands at a ratio of approximately 3:1. Please refer to Appendix I for the details of the plan. It is anticipated the new wetlands will be superior to the impacted wetlands in function and value. The new wetlands would sufficiently mitigate any wetland habitat loss associated with the Project.

Antennaria flagellaris (Creeping pussytoes)

The proposed heap leach pad impacts the *Antennaria flagellaris* population located in Section 1 T36N, R9E. As discussed in Chapter 3, Section 3.4, this species was thought to exist in only one location in California. Subsequent research has shown the existence of at least 54 previously unknown populations, one in Lassen County which is equal in size and density to the Section 1 population and four others in Modoc County which are equal to or larger than the Section 1 population (Grant 1991). The Section 1 population contains approximately 20 percent of the individuals presently known to exist in California. Exhaustive searches have not been conducted and other populations may be found should a concentrated effort be made. Habitat for this species appears to be fairly common. The following are a few characteristics common to *A. flagellaris* habitat:

- Very low vegetative cover;
- Rocky;
- Duripan soil;
- Zero to five percent slopes;
- Dry; and
- Usually associated with Low Sagebrush vegetation type.

The heap leach pad will disturb the Section 1 population, however, the similar population on BLM administered land (Section 11) and the potential for locating other populations alleviates any need to transplant *A. flagellaris*. It is not the policy of the State of California, the BLM or the USFS to transplant threatened and endangered species. Rather, protection is usually prescribed. The Section 2 (two) population will not be impacted.

Exotic Weed Invasion

Concern is often expressed during projects of this nature that, through site disturbance, the proposed Project may facilitate introduction of exotic, or weed, species such as Russian thistle. Removal of vegetative cover often provides open habitat for invasion of opportunistic species, both native and introduced. Many introduced weed species are already established in the Hayden Hill area due to past disturbances, the arid nature of the climate, the wide spacing of perennial plants and the bare ground at the site. Cheatgrass, Bull thistle, Thistle and Filaree are some of the species found on the Species List (Appendix F) which are often considered weeds. The Project would cause additional disturbance and, therefore, would provide additional opportunities for establishment of these weed species. To limit the further establishment of undesirable species it is proposed to reclaim all disturbed areas as soon as practical, and use certified weed free seed and sterile, seed free, straw, as stated in the Reclamation Plan. If invasion of exotic plants becomes a serious problem, a weed control program would be implemented in compliance with applicable Federal, State and local laws. The weed control efforts would be implemented in conjunction with fertilization and seeding procedures and completed before weed species are firmly established. Impacts due to weed encroachment are not considered to pose a significant impact at the site.

Miscellaneous Disturbances

Approximately 5,000 square feet or 0.11 acre of Manzanita shrub vegetation will be disturbed as a result of the construction of the new fire lookout tower on the top of Snag Hill. Approximately 200 feet of access road will disturb another 1.8 acres of primarily Wyethia/grass vegetation. The impact of this lost vegetation is considered insignificant if all remaining disturbed areas are reclaimed.

The vegetation along the power line corridor from the Hayden Hill Road junction with Highway 139 to Adin is not expected to be disturbed to any significant degree. Poles will be placed with discretion and the majority of vegetation will be spanned by the power line. If in the immediate area where poles are placed a small amount of disturbance occurs, the soil will not be removed and re-invasion of plant material should be rapid.

Monitoring

On any large reclamation project there is always the chance some or all of the re-vegetation could fail. For this reason monitoring is proposed as a mitigation measure in the following section. The Reclamation Plan (Appendix E) includes a success evaluation which includes monitoring for revegetation failure.

Vegetation Impact Summary

The vegetated areas disturbed by the proposed Project represent less than 43 percent of the area within the boundary site and far less than 1 percent of the vegetation in the MNF. The site has experienced considerable past disturbance which has not been reclaimed other than by natural means. Re-vegetation of the majority of the disturbed areas will occur through the efforts of the Reclamation Plan or by natural processes. A large percentage of the pit, waste rock dump, mill and process facilities, heap leach pad, solution ponds, administrative area and haul roads would be reclaimed by redistribution of stored growth media and by seeding and fertilization, or other re-vegetation methods determined appropriate by the re-vegetation research program planned as part of reclamation required by the California Surface Mining and Reclamation Act (SMARA). Other disturbed areas such as the steep rock faces of the pit high walls and steep slopes of the waste rock piles will be allowed to re-vegetate naturally. The inclusion of these rough areas will increase the topographic diversity and, thereby, the habitat diversity.

Vegetation establishment is, in part, a function of the type and degree of soil disturbance. Excavated or compacted soils as a result of construction or human activity may take longer to recover than soils disturbed by natural causes, such as fires or flooding. This is, in part, because the seed stock and related symbionts, such as bacteria and mycorrhizal fungi, are not usually lost in natural disturbances, while the nature of mining usually requires the complete removal of these ecological components. It has been shown that some trees are dependent on these micro-organisms for a part of their nutrition (Oswald and Ferchau 1963). Re-vegetation strategies for the Hayden Hill Project include removing and preserving the growth media, including the components mentioned above, and replacing it just prior to seed bed preparation and seeding. Seed bed preparation would include ripping or scarifying compacted areas and adding fertilizer as needed. For these reasons, the vegetational cover impacts for these areas which will be reclaimed at the site are considered short-term. The area which will not be reclaimed, the lost habitat values and the lost commercial timber value are considered long-term impacts. The impacts to 6.55 acres of wetlands, 1,315 lineal feet of intermittent stream channel and 80 lineal feet of permanent stream channel represent a loss of vegetational habitat. The importance of this habitat is well understood as indicated by current changes in the Clean Water Act (CWA). For these reasons, the impacts to wetland habitats are considered long-term. The impacts to wetlands and habitat values of Jeffrey Pine/ Mountain Shrub, Low Sagebrush, and Grassland vegetation are offset by wetlands creation and the protection and maintenance of similar vegetation adjacent to the Project (Appendix I).

4.2.4.3 Mitigation Measures for the Plant Community

Measures to mitigate potential impacts to vegetation are described below as they relate to local, State and Federal regulations. Additional measures have been proposed to be incorporated into the design of the Project to minimize disturbances and facilitate re-vegetation success. Implementation of these measures would reduce the impact to vegetation.

Regulatory Requirements

The potential effect to plant species is subject to the Federal ESA, which extends legal protection to plants listed or officially proposed to be listed as endangered or threatened. The Project will be reviewed for ESA compliance by the Bureau of Land Management (BLM), USFS and Lassen County. Plants listed as endangered or threatened, as well as candidate species, are also given protection by the California ESA and the Native Plant Protection Act, as administered by the California Department of Fish and Game (CDFG). No listed plants or plants officially proposed to be listed were found to occur within the Project site boundary. However, four species of special status do occur in the area. These plants are discussed in Chapter 3.0, Section 3.4.

Lassen County is responsible for administering SMARA. As directed by this agency, the Applicant will implement a re-vegetation program designed in conformance with the objectives of Federal and State policies for reclamation. Re-vegetation of the majority of disturbed areas including the pit, the heap leach pad, the waste rock dump, the mill/processing area, the solution ponds, haul roads and the administration building area will be accomplished. The reclamation and re-vegetation activities will be monitored by the BLM, USFS and Lassen County authorities for compliance with State and Federal regulations.

Wetlands are regulated by the CWA. The CWA is administered by the Corps of Engineers and the Environmental Protection Agency (EPA) in a joint effort defined by a memorandum of understanding between the two agencies. The wetlands regulations require mitigation of all impacted wetlands. The Applicant will comply with these regulations (Appendix I).

Mitigation Measures for Vegetation

The following mitigation measures are proposed in response to the impacts resulting from the Proposed Action discussed in the previous sections.

In regard to the long-term loss of habitat and vegetation related to the pit and waste rock dump: (The following mitigation measures are all included in the revised Reclamation Plan, Appendix E.)

- 150 Jeffrey Pine containerized seedlings per acre will be planted in all disturbed areas of Jeffrey Pine/Mountain Shrub vegetation type as presented in the Reclamation Plan (Appendix E).
- The steeper areas of the pit and waste rock dump, which are not proposed to be reclaimed, will be hydroseeded with an appropriate seed mix.
- The Habitat Management and Mitigation Plan, as presented in Appendix I, will be implemented.

In regard to the new fire tower to be constructed on Snag Hill:

- The disturbance caused by the construction of the fire tower on Snag Hill will be reclaimed consistently with the Hayden Hill Reclamation Plan and the mitigation measures proposed herein.

In regard to the long-term impacts to wetlands:

- A comprehensive permit application consistent with the Corps of Engineers 404 and California 1603 permit requirements, has been completed. The permit includes a mitigation plan which specifies the creation of a self-sustaining 18.5 acre wetland, with both shallow and deep seasonal marsh, with vegetative cover percentages and success criteria. A minimum 150 foot strip bordering the wetland will be managed to increase forb production. The mitigation plan is included in Appendix I. This mitigation plan will be implemented.

In regard to the successful reclamation of the Project:

- Monitoring of the success of the reclamation procedures will be completed annually and reported to the County, BLM and USFS. Monitoring will be based on plant cover, density and species richness, as described in Section 4.9 of the Reclamation Plan (Appendix E). The proposed method of evaluation of reclamation success is a comparison of vegetative cover, density and species richness on reclaimed areas to similar undisturbed areas.

In regard to reclaiming areas as soon as possible after growth media has been placed to avoid erosion, sedimentation and noxious weed invasion:

- A plan indicating a schedule for interim reclamation will be prepared and supplied to the County, BLM and USFS within one year of the beginning of construction. This plan will be strictly followed and updated as Project changes necessitate.

4.2.4.4 Unavoidable Adverse Impacts

Approximately 105 acres of commercial timber producing land will be lost. Commercial timber will be harvested so the timber value will be obtained but the habitat value and future productive capability will be lost as a result of the Proposed Action. Attempts to reclaim similar areas to productive timber stands have been unsuccessful (Farschon 1991). With the loss of soil structure and a maximum of 12 inches of growth media being replaced, it is questionable reclamation of this quality will be possible at this site. This impact remains a long-term, adverse unavoidable impact. However, the acreages involved are small compared to those available, and this impact is considered insignificant.

Two hundred and ninety-six acres of Jeffrey Pine/Mountain Shrub vegetation, 355 acres of Low Sage Brush vegetation, 244 acres of Upland Shrub vegetation, 48 acres of Grassland vegetation, and 6.55 acres of wetland vegetation will be reclaimed. However, it will take time for the vegetation to become sufficiently established to provide the habitat qualities it once had. This impact is considered a long-term, adverse unavoidable impact. The Habitat Mitigation Plan, included in Appendix I, presents mitigation for these impacts. Following mitigation, these impacts are considered insignificant with the exception of the Low Sagebrush habitat impact which remains significant.

All other impacts to vegetational resources would be rendered insignificant with the implementation of the mitigation measures proposed in Section 4.2.4.3.

4.2.4.5 Cumulative Impacts

Approximately 105 acres of Jeffrey Pine/Mountain Shrub vegetation that would be impacted by the Project is designated commercial timber. Reclamation and natural reforestation are unlikely, at best, to reproduce a commercial timber stand in the near future.

Other commercial timber areas in the vicinity of the Project are being considered for sale. However, there are no other projects or activities in the area now or in the foreseeable future which would remove timber lands from future production. Therefore, the lost commercial timber producing land is considered a direct impact of the Project and not a cumulative impact. No other cumulative impacts were identified for vegetation.

4.2.5 Wildlife and Aquatic Biology

4.2.5.1 Issues, Concerns, and Opportunities

The ICOs relating to Wildlife and Aquatic Biology are listed below:

1. What measures will be implemented to prevent wildlife mortality due to cyanide/mine processing residue contamination?

2. Which species/habitats could be adversely affected by the Project and what specific facilities could affect them?

3. Will the Project adversely affect any State or Federally listed threatened or endangered fish and wildlife species or their habitats?

4. How will the Project affect wildlife management in the areas of influence? (State Game Refuge, wildlife management areas on private land, and Willow Creek)

5. How will wildlife be affected by increased traffic to and within the Project area?

6. What measures will be implemented to mitigate habitat losses and impacts?

Issue 1 is addressed by the Proposed Action netting of ponds, enclosed solution ditches, and fencing of the Project perimeter. Issue 2 is addressed in Chapter 3.0, Section 3.5, wildlife. The specific facilities that could impact wildlife are addressed below. Issue 3, protected species, is discussed in Section 3.5, and impacts are discussed below. The State and/or Federally listed species are addressed below, consultation procedures for these species are outlined in Chapter 6.0. Issues 4, 5 and 6, impacts to wildlife and mitigation, are addressed below, issue 4 is also addressed in Section 4.2.9, land use.

4.2.5.2 Impacts to Terrestrial Wildlife

Analysis Approach

The impacts of mining on wildlife and wildlife habitat are determined by the location, timing, extent, and frequency of mining activities or effects induced by mining. The format used to describe and assess impacts of the Proposed Action and alternatives looks at elements of the Project which are common to all alternatives and, in addition, outlines specific elements of individual alternatives when they differ.

A five-step process was used to analyze impacts to wildlife. Step 1 categorized development activities into components. Step 2 identified and described the levels of potential impacts, and was the subject of a meeting of biologists from the BLM, USFS, CDFG, Lassen Gold Mining, Inc. (LGMI), and the EIS team (Steffen Robertson and Kirsten (U.S.), Inc. (SRK) personnel and wildlife biologist) on December 6, 1990 (this group is referred to as the wildlife ID team task group). The wildlife ID team evaluated the information available and specified impacts and significance of impacts. Guidelines for CEQA and NEPA were kept in mind while the significance of impacts were evaluated and discussed. Step 3 specified extent, duration, and frequency for all impacts, which also provided important information for the assessment of whether a potential impact could be considered significant. A wildlife ID team meeting was held on February 6, 1991 to clarify step 3 and discuss monitoring, mitigation and effectiveness (Steps 4 and 5). Step 4 identified potential mitigation measures, and Step 5 evaluated the effectiveness of the measures. The ID team and analysis approach are discussed in Chapter 6.0, Consultation and Coordination.

Identify Potential Impacts and Level of Impacts

Potential impacts were discussed by the wildlife ID team in a meeting December 6, 1990 in Susanville, California. The species and habitats identified by CDFG and the wildlife ID team as having potential significant impacts are discussed in this section and the fisheries section. The Steering Committee and agency wildlife biologists agreed with most of the identified potential significant impacts. When there was a disagreement among biologists on significance, the impact was treated as significant, as suggested in the 1990 CEQA handbook. In this context, any substantial adverse change in the physical conditions which exist in the area was considered a significant effect (CEQA, Chapter 3, 15002. [g]).

Impacts Considered Not Significant

Impacts which were identified and considered to be not significant include increases in opportunistic wildlife species around areas frequented by humans, impacts due to noise, the possibility wildlife could become physically stuck in gelatinous tailings material, impacts due to exposure to toxic or potentially toxic materials, and that wildlife would have access to open cyanide-containing solutions at ponds, leach pads, or ditches. Other impacts considered not significant were impacts from dust, possible poaching, and increased traffic due to improved access. Impacts to fisheries considered not significant are run-off from the heap and tailings impoundments. The decision to consider these issues and impacts not significant was based on facility designs which lessened or eliminated potentially significant impacts, mitigation measures incorporated into the Proposed Action as a result of scoping, and regulations and permit requirements which protect the environment, water, and animals.

Tailings - The concern that wildlife could become stuck in gelatinous tailings was not considered significant because the tailings impoundment is designed to decant standing water and to expedite water evaporation by thin layer deposition. Tailings will be deposited in a wetted condition in a thin layer which will harden as it dries due to the high lime content.

Nevada Department of Wildlife (NDOW) personnel were consulted on this issue, no incidents of this nature have been reported in at least the last two years. They considered this scenario a remote possibility, especially for birds. The NDOW permits 95 mines in Nevada which have tailings and ponds containing cyanide solutions. Nevada Department of Wildlife has been collecting data on wildlife mortality from mines since 1986 (King and Lamp 1991).

Exposure of wildlife to cyanide in the tailings area is considered not significant because cyanide and pH levels will be monitored daily and kept below toxic levels by using a tailings wash thickener and a detoxification process. The NDOW personnel contacted indicated that detoxification of tailings has proved effective in limiting wildlife mortality (King and Lamp 1991). Many facilities report zero mortalities once appropriate monitoring and detoxification processes are in place. Design features of the tailings impoundment limiting the possibility of discharges to the system include control of run-on and run-off by a perimeter dike, a decant system that will return process water to the mill, and a lining system to prevent leakage into the ground.

Some residual cyanide from the processing phase will remain trapped in the interstitial spaces of the consolidated tailings. Low concentrations of less than 10 parts per million (ppm) will remain in these spaces. Environmental factors including ultraviolet light, hydrolysis, and oxidation will further reduce this concentration.

Static bioassay tests to document the effects of the pilot plant tailings material on juvenile rainbow trout were conducted using two dilution levels of tailings (250 and 750 mg/l). Test results were zero percent (0%) mortality in both concentrations of tailings (CH_2M Hill 1989).

Cyanide - The Proposed Action specifies the following design features to limit wildlife exposure to cyanide. Barren and pregnant ponds containing cyanide will be lined, netted (1 inch grid), and fenced to exclude wildlife; all ditches containing cyanide solution will be enclosed, no cyanide solution will be exposed because cyanide solutions will flow through pipes in lined ditches covered with gravel. The tailings will be kept below toxic levels using a wash thickener and a proven detoxification process. Both the heap leach and the tailings impoundment are designed as no discharge facilities and are designed with liners, leak detection, and perimeter dikes to prevent run-on, and perimeter ditches to control run-off. Cyanide is discussed in detail in Section 2.2.8.13. These measures will assure compliance with the Migratory Bird Treaty Act. Appendix N includes the Biological Opinion from the Section 7 consultation with the USFWS.

The BLM mortality data for California for 1990 shows an average of 16 deaths per mine. This figure is cyanide only, but includes all types of animals. The majority of mortalities were to songbirds (6/mine average) followed by waterfowl/shorebirds.

The NDOW has been collecting data on wildlife mortality due to mining operations since 1986. A newsletter published in November 1990, by NDOW states, "With 95 permittees [mines] reporting to date through the third quarter of 1990, the per-mine wildlife mortality statewide continues to decline, and is at its lowest point since mortality record keeping began in 1986." (NDOW 1990). The yearly total wildlife deaths remained about the same from 1986 through 1990, while the number of mines reporting increased from 10 to 95. Preliminary data from the first and second quarters of 1991 indicates nearly a 50 percent reduction in wildlife mortality. This is attributable to the fact that all mines had to comply with pond permit requirements, which included netting or detoxification, by last year.

The average annual mortality rate per mine in Nevada in 1990 was 15. This number includes all mortalities due to cyanide, non-cyanide, roadkill, etc. and including songbirds, snakes, coyotes, and other animals, as well as migratory birds. In discussions with NDOW personnel, it was indicated that the majority of deaths were due to catastrophic events involving toxic tailings (no detoxification system) and open solution ditches and ponds relying on hazing for protection (no netting) (King and Lamp 1991). It is anticipated that the average mortality rate per mine will be even lower this year because of regulatory compliance.

The General Accounting Office (USGAO) recently published a report on Mineral Resources, entitled "Increased Attention Being Given to Cyanide Operations". In this report, in the chapter entitled "At Cyanide Operations Effective Precautions Can Mitigate Hazards", it is stated that preventing wildlife deaths requires restricting access by fencing the perimeter and covering the surface of cyanide ponds with netting or other materials, or diluting the tailings solution to nonlethal levels with water or by chemical detoxification. It is also stated in this report that "FWS (Fish and Wildlife Service) surveyed 45 cyanide operations in Nevada and concluded that netting can prevent most cyanide-related bird deaths." (USGAO, 1991).

Netting has proven effective in excluding wildlife when properly installed and maintained. The Applicant will check netting daily, initiate repairs immediately, and will maintain a supply of netting on-site at all times.

Hazardous Materials - The potential exposure of wildlife to hazardous materials (listed in Table 2.2-4) is limited to accidental spills, leakage, or failure of the proposed netting and tailings detoxification systems. Impacts resulting from wildlife exposure to tailings detoxicants, dust suppressants, road de-icers, weed suppressants, wind-blown cyanide spray, and hardened tailings material were not considered significant by agency wildlife biologists during impact analysis or by NDOW when consulted. Personnel contacted at NDOW were not aware of any documented mortalities arising from exposure to other hazardous materials at mines. The Proper handling of all hazardous materials as prescribed by Mine Safety and Health Association (MSHA), and Bureau of Alcohol, Tobacco and Firearms (BATF) safety regulations. California Proposition 65 will also be followed to prevent any accidents (see Section 2.2.8). In the event of an accident (large or small), all appropriate authorities will be notified, emergency procedures followed, and prescribed mitigation obeyed. The SPCC Plan is required to contain contingency plans in the event of spills and leaks in the Project area, for reporting, clean-up, and disposal of all hazardous substances. The SPCC Plan is located in Appendix L.

Noise - Noise impacts were researched and reported by Brown-Buntin Associates in December 1990 (Brown-Buntin 1990). After a literature search, it was observed there is no conclusive information determining there are effects due to noise, such as blasting, on wildlife. Data on the effects of impulsive noise on wildlife was collected by the Air Force to determine the effect of sonic booms on wildlife (USAF 1977). A study was conducted at the Fallon Naval Air Station in Nevada from 1986-1988 to monitor possible effects of supersonic and low-level aircraft overflights on wildlife. The results indicated that aircraft disturbance had little observable effect on bighorn sheep and wintering mule deer. Some avian species were sensitive to low-level overflights and other species seemed to habituate to the disturbance. Several other field studies have concluded noise disturbance minimally affects wildlife. A synthesis of these studies noted the uncertainties of sonic booms on wildlife, and concluded there were no known quantifiable effects (USNERC 1988). Noise from blasting is not expected to have a significant adverse effect on wildlife, as no quantifiable effects upon wildlife can be ascribed to other similar noise exposure (Brown-Buntin 1990). Section 4.2.14 contains a more detailed analysis on the literature pertaining to this subject.

Impacts

Significant potential impacts to wildlife are listed below by species and/or habitat. Unless otherwise specified, impacts listed are considered significant, direct, long-term, and adverse. Impacts are considered short-term if the impact does not extend beyond the life of the mine including closure and reclamation (approximately 10 years).

- Sage Grouse
  The Proposed Action would result in the loss of two leks, which supported at least 32 grouse in 1990 and only 20 in 1991. One lek is in the area of the proposed heap leach, the other in the area of the proposed tailings impoundment. The loss of 355 acres of summer range (Low sagebrush) and associated nesting areas which are in Big sagebrush will occur. Also affected is 35 acres of natural Grassland habitat, which is necessary for the raising of young in the summer. Critical winter range will not be impacted. The population associated with the two leks is small and sensitive to habitat disturbances. The population has apparently been isolated from the main range of the species to the east by the invasion of Juniper vegetation into sagebrush vegetation types. Therefore, this population receives little or no genetic interchange with other populations. The potential exists for loss of reproductivity and extirpation of this isolated population, which is near the western limit of sage grouse in North America. This could result in a loss of genetic diversity. Lesser impacts include the potential for disturbance or displacement due to human activities, such as blasting noise, mine traffic, and loss from road kill (short-term).

- Mule Deer
  Loss of up to 550 acres of summer range in the Jeffrey Pine/Mountain Shrub and Upland Shrub habitat, and consequent loss of mule deer carrying capacity and population is an expected result of the Proposed Action (short-term). The population is estimated at 20 deer/square mile, and up to 50 individuals have been observed in the Project area. According to BLM wildlife biologists, this loss is considered minor regionally and is not expected to be measurable in the Adin deer herd census work. Concern has been expressed by CDFG that there is potential for disruption of seasonal migration/movement through the area. Mule deer may migrate to the northwest from summer range southeast of the Project area. Presently, CDFG is in the process of collecting data from deer which were captured and radio-collared in the area in November, 1990. Other impacts include the alteration of use patterns due to displacement, disturbance, or attraction (short-term); loss from road kill due to increased traffic (short-term); and increased illegal hunting pressure due to access road improvements.

- Pronghorn Antelope
  The Proposed Action would result in the loss of 355 acres of Low sagebrush and Grassland habitat used for summer range and kidding areas. This loss in habitat will result in a slight loss

of carrying capacity. Herds of 50 to 120 have been observed in the Project area. Antelope populations in northeastern California are at peak historical levels and loss of 360 acres of habitat, while locally significant, is considered regionally insignificant (Farschon 1991a). There is the possibility for disruption of a migration corridor from winter ranges in Big Valley (northeast) and also to the southeast. Other impacts include alteration of use patterns through displacement and disturbance from construction, traffic, and noise (short-term); possible loss through fence entanglement (short-term); and increased illegal hunting pressure due to access road improvements.

- Jeffrey Pine Habitat
  The Proposed Action would result in a loss of 296 acres of Jeffrey Pine/Mountain Shrub habitat. The majority of this vegetation type is located in the area of the proposed waste rock dump. Wildlife species richness and diversity are highest in this habitat type. A small part of the area to be lost contains a mixture of sapling, pole, and scattered mature trees. Additionally, snags, downed logs and multi layered canopy structure contribute structural diversity to the wildlife habitat. Wildlife species dependent upon forested habitats will be impacted including the potential loss of one nesting Goshawk pair. Goshawks are USFS Management Indicator Species (MIS) species and are listed as SSC 2 by the CDFG Table 3.5-1. Other species affected include woodpeckers, nuthatches, grey squirrels and other forest species listed in Appendix G. The region contains a large percentage of acreage of this type so loss of 296 acres would be a minor impact, but is still considered significant, long-term, because it could take up to 100 years to develop a mixed aged class stand of conifers with downed log and snag components similar to that which exists in the study area (Farschon 1991a).

- Golden Eagles
  The anticipated effects of the Proposed Action on the golden eagle are not considered to be significant. The home range of a pair whose nest is over a mile east of the Project, is unknown. The nest site will not be impacted directly by the Proposed Action or the access road. Approximately 400 acres of foraging area and prey base will be lost (short-term). Birds in similar habitat in Wyoming had home ranges varying between 4 and 10 square miles. Losses due to road kill while eating carrion are a distinct possibility, especially for young golden eagles (short-term).

- Prairie Falcon
  There is a known nest site on the north side of Hayden Hill which would be covered by the proposed waste rock dump. The nesting success of this pair and the location of alternate nest sites is unknown. There have been no observations of this pair in 1991. Falcon hunting territories are large so the Project would affect a small portion of the foraging area and prey base

(short-term). The loss of 4.5 acres of rock outcrop is short-term due to the availability of pit high walls for nesting, post-mining.

- Bald Eagle
  Bald eagles could potentially be impacted by ancillary facilities. No direct impacts have been identified or associated with the mine operation. The 17 mile power line will increase the potential for mortality due to strikes with the power line or support cables. This impact is most likely to occur during fog, or migration season when birds are present that are unfamiliar with the territory. Other impacts are potential losses due to road kill while eating carrion, loss of some foraging area (short-term). These impacts were not considered to be significant because all power lines will be constructed with wire spacing to prevent raptor electrocution, the access road will have a 25 mph speed limit, and the loss of forage area is small. (BLM 1991) The Biological Opinion in Appendix N states, "Although the area affected by the Hayden Hill Project is within the range of bald eagle and the American peregrine falcon, these species likely will not be affected by the Project proposal."

- Peregrine Falcon
  The only potential impact to Peregrine falcon identified is power line collisions. No Peregrines have been observed in the area, although it is likely they may hunt in the Silva Flat area. No impacts to the falcons that occasionally occur in the area are foreseen. (BLM 1991) As stated in the Biological Opinion quoted above, this species likely will not be affected by the Project proposal.

- Greater Sandhill Crane
  Sandhill cranes are not expected to be adversely affected by the Hayden Hill project for several reasons. Sandhill cranes have been observed at the site on rare occasions. They have not been observed to nest here. The wetland habitat affected by the project is not important to local sandhill cranes. Less than 1 acre of natural wetlands and 5 acres of detention ponds will be lost. These wetlands are of poor quality and could not be described as good crane nesting habitat. Sandhill cranes appear to adapt to adjacent construction disturbance as long as their habitat quality does not decline (Sharp 1991). Mitigation by the production of 18.5 acres of higher value wetlands would benefit the sandhill crane population. No significant impact is expected to sandhill cranes.

- Wetland/Riparian Habitat
  Approximately 6.55 acres of open water and other wetland habitat would be lost under the heap leach pad, 80 feet of perennial stream channel would be lost due to crossing improvements, and 1,315 lineal feet of intermittent stream channel would be disturbed by the heap leach pad and

other crossings. This would result in the loss of succulent forage used by herbivores and the loss of nesting areas used by water associated birds. This habitat type is very important to wildlife.

4.2.5.3 Impacts to Fisheries and Aquatic Resources

This section addresses potential impacts to fisheries and aquatic resources from the Proposed Action. Potential environmental impacts from mining and associated activities are related to mine facility siting, construction activities, run-off from the waste rock dump, point source storm water discharges, sedimentation due to construction, dust generation, and dust and contaminants in run-off from Highway 139 and mine area roads. Water quality, monitoring, impacts, and mitigation for all surface and groundwater are discussed in Section 4.2.6, Impacts to Water Resources. Erosion and sediment control is discussed in detail in the revised Reclamation Plan, located in Appendix E.

The potential presence of Modoc sucker, *Catostomus microps*, a Federally listed endangered species, in the Willow Creek drainage requires a thorough evaluation of potential impacts to this species and its habitat. The assessment of fishery impacts is based on the assumption Modoc sucker are present in Willow Creek, although they have not occurred in recent sampling surveys. This assumption is made in consideration of the fact that Willow Creek is historical Modoc sucker habitat. Sampling and electrofishing were not permitted since these techniques could cause a loss of fish.

Direct Impacts

The impacts discussed below for Modoc sucker can also be applied to all other fish species present. The degree of impact would vary by species and life history stage.

- Modoc Sucker

  The potential direct impacts to Modoc sucker as a result of the Proposed Action are fuel or mine process chemical spills that may enter Willow Creek during transport along Highway 139 and Hayden Hill Road. This impact is unlikely to occur, since the access road will have a speed limit of 25 mph. Construction of the fly-by lane and widening of the crossing over Willow Creek will permanently cover 60 feet of riffle and run habitat. Some sediment will be introduced into the creek during construction (short-term). Cattle grazing will be excluded for 500 feet along Willow Creek upstream of the access road crossing (beneficial).

Benthic Invertebrates

The potential impacts to benthic invertebrates due to construction activities are disturbance to habitat and water quality degradation from increased sediment loads (short-term). These impacts will occur if construction is done during a period of high run-off.

Indirect Impacts

Indirect Impacts include alteration of habitat from disturbance in riparian areas or watershed areas (not likely); changes in habitat due to changes in water quality (short-term); changes in hydrology such as quantity and timing of run-off and sediment delivery, and run-off from the waste rock dump; impacts due to access road improvement and possible loss due to accidental spills into tributaries of Willow Creek. Excessive sediment delivery could result in destruction of habitat, particularly pools and small-gravel riffles.

Access Road Construction - Widening of the Hayden Hill road and improvements to the access road paralleling the unnamed intermittent drainage that includes Indian Springs. The Proposed Action avoids impacts to this drainage by cutting into the road bank opposite the creek. The road will be sloped into the hillside and will be constructed with safety berms on the outside edges where it is adjacent to drainages. Emergency culvert closures will be provided to contain any spillages in the roadway. The measures incorporated into the Proposed Action reduce the adverse effects of access road construction to not significant.

Run-off From The Waste Rock Dump - The aquatic system most affected by impacts to Preston Canyon drainage would be Willow Creek below its confluence with Preston Canyon. The Proposed Action states that surface run-off from the waste rock dump will be controlled by diversion ditches. Run-off from the diversion ditches will be routed through two diked detention ponds located in the Preston Canyon drainage downstream of the waste rock dump. The lower detention pond will be subject to National Pollutant Discharge Elimination System (NPDES) permitting Denver Knight Piésold, Inc. (DKP) (DKP 1990c).

Run-off from the waste rock dump could potentially introduce sediment and dissolved naturally occurring elements into the Preston Canyon drainage. Sediments introduced into the drainage below Hayden Hill would be transported downstream during high flow periods following snow melt. Sediment deposition would tend to occur primarily in those areas of the drainage that are unconfined or are adjacent to shallow channels or in pools. Pools can be the only summer habitat available to fish. This could have an indirect effect on fish in the stream.

A large portion of the Preston Creek drainage, downstream from Hayden Hill, has been stripped of vegetation and the stream banks have been broken down by cattle grazing. It would be difficult or impossible to distinguish sediments originating at the waste rock dump, assuming they were released into the drainage, from sediments eroded off areas subject to cattle grazing, in the lower portions of the drainage.

The current data show disposal of waste rock from the mining operation has minimal potential for introducing dissolved elements and acidic discharges into local drainages. The waste rock dump has been classified a Group C waste facility, since the waste rock tested to date suggests a low acid generating potential. Acid generation potential of the waste rock dump is discussed in detail in Chapter 2.0 and Chapter 4.0 in Section 4.2.6. The effect of lowered pH due to acid generation, should it occur, would depend upon the diversity of chemical elements and their concentrations.

The monitoring and contingency plan for this area reduce the potential for adverse effects to not significant. The contingency plan is located in Appendix M.

Run-off from Highway 139 and Other Roads - Run-off from the highway flows either directly to the creek, into tributaries to the creek, or into unconfined portions of the watershed. Accidental releases of materials being transported to or from the mine along the access road could enter Willow Creek. Spills along Hayden Hill Road would eventually enter Willow Creek. Dust and other contaminants (i.e. oil, gas, antifreeze, dust suppressants), which may accumulate on the road surface, could also reach surface waters.

Release of any hazardous materials into Project area surface waters could result in lethal or sub-lethal effects to aquatic biota. The extent of contamination would depend on the amount and type of material released, the distance of the spill from the creek, the character of the watershed between the spill and the creek, and creek flow.

Impacts to Wildlife Summary

Impacts identified for the access components of the Project include removal of habitat along roads, increased road kills, increased poaching, and habitat destruction resulting from new or improved access. Facilities impacts include disruption of seasonal movement patterns, elimination of habitat in the pit and associated mine area, including critical habitat for some species, and increased disturbance in the vicinity of the mine which reduces the value of adjacent habitat for species sensitive to disturbance. The potential impacts from operations include habitat loss, increased disturbance, noise, sedimentation, and risks from hazardous materials spills.

4.2.5.4 Mitigation for Terrestrial Wildlife

Proposed Mitigation

Table 4.5-1 presents a summary of the impacts and mitigation measures for the Project. California Fish and Game and the Applicant, LGMI, have developed a Wildlife and Habitat Mitigation and Management Plan (HMMP). The Mitigation Plan specifies what the applicant will do to mitigate wildlife and habitat impacts on a species by species or habitat basis. The Mitigation Plan is located in Appendix I. The

TABLE 4.5-1

PROPOSED MITIGATION PLAN SUMMARY

Impact	Mitigation
Pronghorn and sage grouse Low Sagebrush habitat loss.	Enhancement of 355 acres of low sage habitat adjacent to the site. Monitoring of populations and habitat, relocation of leks per mitigation plan.
Mule deer Mountain Shrub/Upland Shrub habitat loss.	Enhancement of 1500 acres of habitat in Gerig Burn, until reclamation is complete. Monitoring of populations and habitat.
Mule deer and pronghorn seasonal use movement pattern changes.	Maintain similar movement patterns, monitoring during and post-mining; develop solutions with CDFG if problems arise.
Loss of Jeffrey Pine Habitat.	Protection of 230 acres of Jeffrey Pine habitat at Anderson Ranch, until reclamation bond release.
Golden/Bald eagle road kill.	Remove all carcasses from the access roadway and shoulder. Move to a location out of sight where eagles can scavenge safely.
Loss of Wetland and Meadow Habitats.	Create 18.5 acre wetland adjacent to Project Area. Manage livestock grazing. Protect 35-40 acres of lush meadow habitat in Anderson Ranch.
Mortality due to mine operations such as road kill, toxic or hazardous materials ingestion or exposure, etc. (i.e. cyanide, tailings)	Keep records and report mortalities to CDFG, comply with mitigation as required. Limit bird and bat exposure to cyanide on the heap by monitoring to avoid ponding of solutions. Adjust application rates if pools develop. In the event of net failure, begin repairs immediately, post 24-hour watch armed with marine radar, screamer shells etc. to scare away wildlife.
Raptor nesting habitat.	Pit walls and benches will be modified to contain suitable nesting habitat for raptors post-mining.

Applicant is responsible for all mitigation measures and associated costs. The Applicant would also be fully responsible for any mitigations and costs on agency land (should it become necessary to use agency land). Cost estimates of mitigation measures are provided in the Habitat Mitigation and Management Plan (HMMP), in Appendix I. Mitigation included in the Proposed Action consists of the identification of critical areas and the design of mine facilities to avoid or minimize impacts. Additional mitigation is proposed for species and habitats listed in the impacts section. The loss of cliff and outcrop habitat will occur only through the life of the mine as the walls of the pit are expected to provide suitable cliff habitat after the mine is closed. The following items are mitigation measures proposed for each species and habitat:

Sage Grouse

- Attempts will be made to passively relocate the impacted lek by luring young male grouse to new leks created in areas not affected by mining activities. Continued attraction of new males may be needed annually. The impact to the pond lek will be delayed until construction of Stage II of the heap leach pad (mid to late 1993). A proposed plan outlining the passive attraction of sage grouse to new lek sites is located at the end of Appendix G.

- Temporary road alignment alteration from start of project construction to start of construction for Stage II of the heap leach pad. During March and April vehicle drivers will be advised to watch for grouse movement near the road by the pond. The road speed limit will be posted and maintained at 20 mph.

- Manage grazing on pasture in Sections 1, 2 and 11 (Figure 1 in Appendix I) to produce succulent forbs, the sage grouse are attracted to, during the late summer. The grazing management will consist of resting the area from livestock grazing for one year. After the first year, livestock grazing will be monitored to protect at least 50 percent (by weight) of the annual herbaceous vegetation production. The Mitigation Plan in Appendix I contains more details.

- Manage at least 355 acres of Low Sagebrush habitat in Section 2 to enhance habitat for sage grouse. The area will be given a two year rest from livestock grazing. The area will then be evaluated by the LGMI range professional and evaluated with CDFG. The grazing prescription will be developed. Grazing will be managed to protect at least 50 percent (by weight) of the annual herbaceous vegetation production.

- An 18.5 acre created wetland will be constructed in Section 2 adjacent to the project area. The wetland will provide increased succulent forb production around 150 feet of the periphery. The Wetland Mitigation Plan is located in Appendix I.

- Manage grazing on upland big sagebrush to maintain or improve habitat for grouse. This area will be rested for two years from livestock grazing and evaluated. Only light grazing which removes 30 percent of the current year's growth will be permitted.

- The contingency plan, should the relocation program be unsuccessful, is to maintain and improve habitat sufficient to support a 25-40 bird increase in sage grouse at an area of habitat, within historic grouse range, elsewhere in Lassen or Modoc County. The criteria for extirpation is that less than 3 displaying males are observed at the new lek or other leks that may arise in the vicinity, for three consecutive years.

- Mark any new fences constructed in sage grouse habitat by hanging colored tape strips from the top wire to make the fence visible and prevent mortality (Call and Maser 1985).

Mule Deer

The goal is to maintain overall existing mule deer migration patterns through the area, during and after the life of the mine. If severe problems in deer movement occur, additional mitigative measures will be determined by negotiation between CDFG and LGMI.

- The Applicant will carry out procedures for the enhancement of 1500 acres of Mountain Shrub/Upland Shrub plant community, in the Gerig Burn area of the Big Valley Ranger District. Prescribed burning will be used to enhance the shrub community. This will be accomplished with the cooperation of the USFS and CDFG within two years of issuance of the Conditional Use Permit (CUP).

- Annual ground and aerial counts will be conducted by LGMI in cooperation with CDFG to help determine if movement or population is being affected by mine operations.

Pronghorn Antelope

The goal for pronghorn mitigation is to maintain populations and distribution similar to those during pre-mining conditions.

- Grazing will be managed on 355 acres of Low Sagebrush habitat adjacent to the Project area to increase forb production and other habitat values. The grazing prescription and location are the same as for sage grouse above. (See Figure 1 in Appendix I).

- Manage created wetlands to maximize pronghorn forage production, along with sage grouse on the same meadow area. The wetlands mitigation is described in detail in Appendix I. Grazing management will be the same as for sage grouse habitat, as described in the HMMP (Appendix I).

- The Applicant will continue a joint CDFG-LGMI program of monitoring pronghorn population and distribution by seasonal aerial and ground surveys to help determine if movement or population are being affected by mine operations.

Golden and Bald Eagles

The created wetland will increase habitat quality and quantity, and forb production for the area. This will increase the small mammal population and therefore will replace some of the loss of prey base for eagles and other raptors.

- A permit will be obtained from CDFG by the Applicant to allow for the removal of any roadkill carcasses from the road or shoulder. The carcasses will be dumped a sufficient distance (not visible) from roads and mine facilities where eagles can scavenge without risk.

Prairie Falcon

The goal is to create suitable nesting habitat for prairie falcon post-mining.

- The mine pit wall will be reclaimed to provide suitable nesting habitat using technology of documented success to create nesting potholes in the pit walls.

Peregrine Falcon

Although no significant impact is expected to this bird, pit development will create suitable cliff nesting habitat to cliff nesting raptors, as part of the reclamation process.

- The mine pit wall/benches will be reclaimed to provide suitable nesting habitat raptors using accepted technology and structures (Tessman 1982 and Green 1987).

Greater Sandhill Crane

The goal is to enhance potential sandhill crane nesting habitat through creation of an 18.5 acre wetland which will include deep seasonal marsh. The wetlands mitigation plan is described in detail in Appendix I. It is anticipated that improved habitat quality and quantity of the created wetlands will result in successful breeding activity by local cranes.

- The created wetlands will be comprised of at least 13 acres of shallow or deep seasonal wetlands. It is anticipated this deep seasonal wetland will provide favorable nesting habitat for the greater sandhill crane.

- Monitoring of sandhill crane populations will consist of monthly visits between April and September to determine if nesting has occurred and is successful.

Jeffrey Pine/Mountain Shrub Habitat

The goal is to protect 230 acres of mature Jeffrey pine habitat on the Anderson Ranch property and land adjacent to the Project as shown in Figure 1 of Appendix I. This action will aid in minimizing impacts to species dependent on large mature pines. Fire protection measures will follow CDFFP guidelines.

- These areas on the Anderson Ranch property will not be commercially harvested until reclamation bond release. Management practices to improve habitat diversity, such as single tree removal, may be implemented after consultation with CDFG.

- The Applicant will sort and store stockpiled soils on the Project site so that forest soils are replaced onto sites to be planted with conifers.

- During reclamation the Applicant will plant 150 containerized seedlings per acre on waste rock dump benches. Downed logs and snags will be placed on the benches as they become available.

Wetland/Riparian Habitat

The goal of wetland mitigation is to compensate for the losses due to the project, by creation of an 18.5 acre self-sustaining wetland. The wetland mitigation plan provides for compensatory mitigation on-site with a sufficient amount of wetlands created to assure there will be no net loss in wetland area or functional values. The following will also constitute the success criteria standards as stated in the Wetlands Mitigation Plan (Appendix I).

- Approximately 18.5 acres of self-sustaining waters/wetlands will be created. Of this total, a minimum of 13 acres shall be comprised of shallow or deep seasonal wetlands (6-20 inches). A minimum area of 18.5 acres will be inundated or saturated for at least 10 days during the growing season in an average precipitation year.

- A minimum of six nesting islands will be constructed.

- A minimum of 150-foot wide strip bordering the wetland will be managed to increase forb production. (To enhance sage grouse and pronghorn forage, and to create suitable white-faced ibis nesting habitat - beneficial.)

- Livestock grazing will be allowed only as part of a specific and controlled wildlife habitat enhancement program.

- Impacts to permanent and intermittent streams will be mitigated by enhancing stream habitat in Anderson Ranch. This will be accomplished by grazing management to produce additional vegetation and habitat diversity along streams.

Meadows

The goal is to maintain 35-40 acres of lush forb-rich meadow at Anderson Ranch, shown in Figure 1 of Appendix I, to replace that temporarily lost to the Project. Grazing limitation will be used to maintain high habitat value for a diversity of wildlife species.

- The meadow portions of Anderson Ranch will be rested from livestock grazing for one year.

- Headcuts in the meadow will be stabilized by recontouring and planting cuttings from willows native to the meadow area, following SCS standards and specifications.

- After completion of stabilization and planting, grazing will be managed to prevent degradation and to enhance meadow vegetation. Grazing will be restricted to late spring and early summer periods.

Other Mitigations

Mortality from Cyanide - The goal is zero mortality, to prevent wildlife mortality due to cyanide exposure. The Proposed Action was to net with a larger grid size. This has been modified as a result of the NEPA and CEQA process to net all solution ponds with an effective grid size of 1 inch. Netting will be inspected daily. In case of net failure, immediate repair will be undertaken. A supply of netting will be maintained on-site at all times. The tailings pond solution will be neutralized to cyanide concentrations not lethal to wildlife.

Mortality from Roadkills - The goal is to avoid roadkills, recognizing that a slight increase locally in roadkill is not expected to have a significant impact. Use of company vans will be encouraged to reduce traffic on the access road. Commuters will be educated on how to safely avoid many roadkill situations. The speed limit on the access road will be 25 mph. The access road around the pond will be re-routed to avoid disturbing the pond lek until Phase II construction of the heap leach. As stated above under eagles, LGMI will acquire the appropriate permit to remove road kill from the road surface. All road kill will be reported to CDFG as required by the permit and State laws.

Mortality Reporting - Mortality reporting will follow required BLM, USFWS, and CDFG procedures for all reportable deaths. The BLM requires monthly reports of all cyanide related mortalities. The Migratory Bird Treaty Act requires immediate notification of the United States Fish and Wildlife Service (USFWS).

Restriction of human access and disturbance is often difficult to enforce, but mine employees will report any poaching activity observed to the CDFG. Shooting of firearms on mine property is not allowed under MSHA regulations. It is LGMI company policy not to allow firearms on site. If someone has a firearm in their vehicle, they are asked to check it in and leave it with mine security. Fencing of wetland areas and along Willow Creek at the mill site will be maintained to keep livestock from breaking into these areas of lush forage.

Summary

These mitigation measures have been extracted from the HMMP and Wetlands Mitigation Plans located in Appendix I. Table 4.5-1 summarizes the proposed mitigation measures for issues raised by the public during scoping and review of the draft.

The species and habitat mitigations proposed employ proven methods which have been implemented successfully at other similar sites. The Applicant is responsible for all costs associated with the mitigation and monitoring described. The sage grouse lek passive move outlined in Appendix G has been implemented successfully once. Other similar methods have been successful a number of times in the Great Plains and the Great Basin areas.

4.2.5.5 Mitigation Measures for Fisheries and Aquatic Biology

Mitigation of environmental impacts to aquatic resources for the Hayden Hill Project include the following measures: 1) Avoidance of environmental impacts; 2) Minimization of environmental impacts; and 3) Mitigation of unavoidable environmental impacts. This section discusses these measures for each of the possible environmental impact sources presented in Section 4.2.5.3.

Construction Activities

The construction and widening of the Hayden Hill Road crossing over Willow Creek at Highway 139 will have the greatest potential impact on aquatic habitats. Proper design and installation of the culvert are crucial to minimize impacts. Impact minimization will be achieved through the following measures:

- Construction will be scheduled during the low flow period.
- A bottomless steel culvert design was selected by CDFG. Several alternatives were examined before selecting this design. The bottomless culvert will result in the least change to the existing substrate at the crossing. Approaches to the culvert will be protected by double rows of gabions set into the banks.

- Sediment trapping facilities will be provided downstream from the construction.

- Remove by seining, any fish that are living in the immediate vicinity of the construction activity and for 500 feet down stream, and place them in permanent habitat further downstream in Willow Creek. (Biological Opinion, Appendix N)

Avoidance will be used to minimize disturbances to wetland vegetation. Road widening along the unnamed intermittent stream in the Indian Springs drainage will employ the following design and construction techniques to avoid and minimize potential impacts to the adjacent drainage:

- Sediment trapping facilities (silt fence, hay bales, etc.) will be provided along the base of construction areas along the creek, where adjacent to drainages.

- Berms will be constructed and emergency culvert closures provided to contain any spillages within the roadway.

- Detention ponds will be designed and built at appropriate intervals along the access road to intercept waterborne sediments originating from run-off and dust settlement. The areas selected for detention ponds are already naturally occurring and will only be manipulated enough to provide the necessary protection against sedimentation.

Waste Rock Dump

The design of the waste rock dump includes diversion ditches to collect and divert run-off and precipitation from a 1000-year, 24-hour event (KP 1990b). The DKP Report on Waste Discharge states the waste rock storage area will be inspected at least monthly and following precipitation events which exceed one inch. The sedimentation pond will be inspected by walking the crest and downstream slopes. Ground water monitoring wells have been installed in close proximity to the waste rock dump. (DKP 1990c)

- Diversion ditches will be planted with appropriate ground cover vegetation to control, ditch erosion. (The revised Reclamation Plan addresses this mitigation measure.)

- The waste rock dump area will be designed for erosion and sediment control, and containment as stipulated by the Central Valley Regional Water Quality Control Board (CRWQCB) waste discharge requirements. (This mitigation measure is addressed in the GSCP, Appendix M.)

- The detention ponds will be constructed for receiving run-off from the waste rock dump area to control sediment. (The revised Reclamation Plan addresses this mitigation measure.)

- Erosion control measures such as seeding and mulching, silt fences, straw bale dams, and diversion ditches will be used during waste rock dump site clearing and construction to minimize addition of sediment to the Preston Canyon drainage. (The revised Reclamation Plan addresses this mitigation measure.)

- If ARD potential is increased during mining operation due to variation of the mined rock from the rocks tested, the waste rock will be treated or neutralized by lime application, segregation and containment or other appropriate measures as provided in the GSCP. (This mitigation measure is addressed in the GSCP, Appendix M.)

Highway and Road Run-off

The major potential aquatic resource impact related to highway and road run-off is the introduction of toxic materials. Several toxic materials will be transported to the mining operation via Highway 139 and Hayden Hill Road. It is reasonable to assume transportation accidents may occur during the life of the Project, and to plan for that eventuality. The widening of the stream crossing and addition of the fly-by lane on Highway 139, and the 25 mph speed limit on the access road should significantly lessen the probability for catastrophic spill of toxic materials.

- Timing of the most hazardous materials transport will be taken into consideration and be adjusted as much as possible to minimize the impact should a spill occur. This means when flow is low, when spawning is not occurring, and when sensitive fry are not present. (Usually late summer to mid-winter.)

Modoc Sucker

Protection measures for the endangered Modoc sucker will require special planning and procedures. In addition to the required SPCC plan for any on-site spills or releases, developed by the mine operator for the mine site, the following mitigation measures are proposed:

- An emergency field procedures manual has been prepared for the protection of aquatic wildlife, including the Modoc sucker, and habitat. These procedures will be followed by the mine operator and all other authorized personnel in the event of a toxic spill.

- These field procedures will be thoroughly exercised on a regular schedule to maintain a competent recovery team.

- Monitor berms, culverts and drainage channels to retention ponds and maintain in proper condition so that any toxic materials that slowly accumulate on parking and other work areas do not wash into Willow Creek or any of its sub drainages. (Biological Opinion, Appendix N)

- Develop and conduct employee training program on the need to treat the environmentally sensitive areas with their endangered species with particular care. (Biological Opinion, Appendix N)

- The USFWS is to be notified within in three working days of the finding of any Modoc suckers found dead or injured in the Hayden Hill Project Area.

The ERP manual was developed in consultation with the USFS and the CDFG, in response to agency concerns, as a result of the EIR/EIS process. The SPCC and ERP are located in Appendix L.

4.2.5.6 Unavoidable Adverse Impacts

Wildlife

Unavoidable adverse impacts include the following:

- Possible disturbance of mule deer and pronghorn movement/migration patterns. If major disruption of migration patterns are observed by CDFG, additional mitigation will be negotiated with CDFG. This impact, if observed to occur, would be short-term, adverse. The significance would depend on the level of impact. The ID team assumes this impact to be not significant.

- Possible loss of the small, local, isolated sage grouse population. The probability of loss cannot be assessed given the information available at this time, but the possibility of loss was considered to be low to moderate by the majority of the biologist team. There was a wide spectrum of opinion about this risk within the team; some individuals considered the risk of loss to be extremely low while others considered the risk to be moderate to moderately high. Intensive monitoring and adjustment of sage grouse mitigation could be the key to a successful relocation of leks and continued survival of this population.

Aquatic Biology

The widening of the Hayden Hill Road crossing at Willow Creek will result in some unavoidable adverse impacts. Some minor short-term impacts will result from construction activities. These will likely include habitat disturbance and sediment introduction into the creek during the construction period. This impact is not considered significant.

Development of the Hayden Hill Project could result in slightly improved sucker habitat in Willow Creek. This would be the result of new livestock exclusion from the creek upstream from the Hayden Hill Road culvert and decreased sedimentation from Preston Canyon. This is considered a long-term beneficial impact.

4.2.5.7 Cumulative Impacts

Wildlife

An upland game bird expert from Montana believes this sage grouse population is already in decline due to stresses from the drought, juniper encroachment, grazing, and isolation from other populations (Bio-Resources 1991a). The Project would add to these stresses and if mitigation measures fail, the population faces extirpation. The cumulative effect of extirpation is the loss of genetic diversity. It is not presently known if this population is truly isolated or if interaction occurs with a nearby population (Bio-Resource 1991d).

Aquatic Resources

Potential cumulative impacts to aquatic resources are related to sedimentation in Willow Creek.
There are no known actions proposed by State agencies within the Willow Creek watershed. Known actions on private lands within the Willow Creek watershed are associated with the Hayden Hill Project. Other private landowners have indicated they do not intend to change from current land uses, which are grazing, farming, recreational use, and logging (BLM, 1991). Mitigation measures described for the mine Project will minimize sedimentation of Willow Creek resulting from construction and mining activities.

Fishman Environmental Services (FES) has prepared a Cumulative Watershed Effects analysis. This analysis utilizes the USFS methodology taking into consideration the effects of timber harvests, grazing, road-building planned for the sub-basins around Hayden Hill, as well as the mining operation. A target level of allowable sedimentation increase is established, and the analysis determines the assumed level of sedimentation resulting from the included activities (FES 1991a). This study is discussed in Section 4.2.6.2 (Sediment). The impacts were not found to be significant.

4.2.6 Water Resources

4.2.6.1 Issues, Concerns, and Opportunities

Issues and concerns related to water resources are listed below:

1. What are the impacts to surface and groundwater quantity and quality?

2. What are the Project water supply requirements?

3. When and how will water resources be monitored, for quality and quantity, throughout Project life?

4. What will the waste discharge requirements be for the Project?

5. What is the status of the Project water rights?

Surface and groundwater quantity and quality impacts listed as Issue 1, are addressed in Sections 3.6.5 and 4.2.6.2. Issue 2 is discussed in Chapter 3.0, Existing Environment, water resources, Section 3.6 and the impacts due to water supply pumping, in Section 4.2.6.2.

A water resources monitoring plan has been prepared as a separate document by DKP (DKP 1990b) which outlines the Project monitoring program. The plan as specified in the DKP report is included as part of the mitigation measures dictated in this document; Section 4.2.6.2.

Issue 4 will be addressed when the Applicant files for a Waste Discharge Permit. Minimum requirements which the CRWQCB might impose can be seen in Section 4.9 of the Reclamation Plan, Appendix E. The waste rock will be classified and any requirements for its disposal will be specified. Requirements are mandated by the CRWQCB after review of data collected from the Project site for the Waste Discharge Permit. Some general discussion is presented in Section 4.2.6.3. The status of Project water rights, Issue 5, are addressed in Appendix C.

4.2.6.2 Impacts to Water Resources as a Result of the Proposed Action

This section discusses impacts to water resources which could result from the proposed Hayden Hill Project. The data is summarized from studies by Hayden Hill Operating Company, Inc. (HHOC), DKP, Hydro-Search, Inc. (HSI), and FES. The assessment of potential impacts includes consideration of mitigation measures resulting from water pollution control and reclamation regulations. A significant impact would be one which:

- Degrades surface or groundwater quality such that other uses would be significantly limited;
- Substantially depletes groundwater resources in the Project area; or
- Inhibits or reduces flow conditions in any of the springs in the area to the extent that the riparian habitat would be substantially affected.

Inherent with the Proposed Action is a level of risk concerning the generation of acid rock drainage (ARD). The engineering design, as presented by the Applicant, should not create any significant impacts. However, if the design does not perform to the specifications presented by the Applicant, a higher risk of ARD will result. Therefore, the mitigation measures outlined in subsequent discussions are intended to reduce the level of risk of ARD production as presented in the Proposed Action.

Surface Water

Effects of the Proposed Action on surface water quantity and quality would be minimal. Willow Creek is the only perennial stream within the Project area. Facilities have been designed to minimize disruption of ephemeral and perennial surface water drainages. Process facilities using reagents (such as the solution ponds) during operation will be designed and constructed to contain large storm flows and avoid overflow discharges, using criteria approved by the CRWQCB.

Based on results of the exploratory drilling for mineral reserve development and hydrogeologic study, no significant quantity of water is expected to be encountered during pit excavation. Due to limited precipitation in the area, and the size of the completed pit, as well as evaporation characteristics and hydrogeologic controls, it is not expected that water would accumulate in the pit to the extent that surface discharges could occur. Pit dewatering operations are not anticipated due to low flow volumes.

A study by DKP (1990) reported that potential soluble materials were determined by the Soluble Threshold Limit Concentration (STLC) and total metals concentration by the Total Threshold Limit Concentration (TTLC) as specified by the California Administrative Code (CAC) Title 22, Chapter 30, Article 11, Section 66699. The test results of the bioaccumulative substance test for both soluble and total inorganic persistence are presented in Table 4.6-1 and 4.6-2 (DKP 1990d). Test results were, in all cases, below the STLC and TTLC values, thereby classifying the wastes as non-hazardous in accordance with the CAC Title 22, Chapter 30, Section 66300-66310.

Design features of the tailings impoundment and the heap leach pad should provide protection from surface water impacts. Potential impacts do exist if ore processing results in mine waste with physical and chemical characteristics that are significantly different than the laboratory samples tested. Surface water quality could be significantly impacted if the waste degrades physically and chemically to produce ARD. Other potential impacts could also include leaching of heavy metals and the precipitation of gypsum in the tailings, thereby changing the physical and chemical characteristics of the tailings. These changes may affect the behavior of the tailings and, therefore, original design assumptions could become invalid.

Though unlikely, spills of cyanide, fuels and processing reagents could potentially impact surface water quality. Design features such as bermed and lined containment areas will minimize the risk of surface water contamination due to spills. Furthermore, the SPCC will be implemented to assist with the prevention and containment of spills and leaks, in the unlikely event that they occur. This impact is not considered significant.

Acid Rock Drainage - The potential for ARD from the Hayden Hill Project was examined by Geochemical Engineering Inc. (GEI 1989), CH_2M Hill and DKP (1990a, c, d).

The concentration of total sulfur in rock is an indicator of the potential for that rock to produce ARD. The form of sulfur (i.e., reactive and non-reactive pyrite) must be considered and the ratio of reactive pyrite to calcium and magnesium carbonate. The analytical tests performed for DKP examined these properties and the results are presented in Table 4.6-3. Acid Rock Drainage potential may also be influenced by the mode of occurrence of these minerals, and the size and shape of the individual pieces of mined rock.

At the Hayden Hill Project, exploratory drilling core samples were visually inspected by a registered geologist for sulfide minerals (primarily pyrite) and blended to make composite samples for analytical purposes. The composite samples represented an appropriate volume of oxide, sulfide and mixed oxide/sulfide waste rock which will be deposited in the waste rock dump.

The samples were tested using acid/base accounting (ABA) methods which demonstrated a wide variation in total sulfur content for both oxide and sulfide waste rock. The statistical data presented by DKP (1990d) for the composited section, 52-200N, are as follows:

Number of Samples	133
Mean	0.24%
Standard Deviation	0.41%
Maximum	2.32%
Minimum	0.02%
Coefficient of Variance	169.19
Variance	0.168
Skewness	2.72

The wide range observed between the maximum, minimum and standard deviation suggests that the samples are not statistically representative of the actual sulfur content of the waste rock. A more exact statistical model of the waste rock would statistically analyze section 52-200N based on the average weighted volume of each sulfur containing layer.

The total sulfur content of the samples used for the ABA tests (Table 4.6-3) were compared to the above statistical values. Based on the results in Table 4.6-3, all of the samples tested, with the exception of LWMC-1 (Lookout Waste Mixed Oxidation Composite), demonstrated substantially lower total sulfur content than the statistical mean value for section 52-200N. Due to the selection of composite samples

TABLE 4.6-1

SOLUBLE INORGANIC PERSISTENT AND BIOACCUMULATIVE SUBSTANCES MINE WASTE

CH$_2$M Hill Laboratory Results
(milligrams per liter)

Constituent	STLC (1)	Lookout Pit			Providence Pit		
		Waste LW-1	Leach LHC-1	Mill LMC-1	Waste PW-1	Leach PHO-1	Mill PMO-1
Antimony	15	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Arsenic	5.0	0.56	0.40	1.4	<0.28	<0.28	<0.28
Barium	100	1.3	1.7	3.52	3.22	2.49	7.39
Beryllium	0.75	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cadmium	1.0	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Chromium	560	0.22	0.48	1.7	0.07	0.11	1.1
Cobalt	80	0.25	0.14	0.17	0.20	0.20	<0.14
Copper	25	0.20	0.24	0.35	0.09	0.09	0.21
Lead	5	<0.6	<0.6	<0.6	<0.06	<0.6	0.90
Mercury	0.2	<0.002	<0.002	<0.002	<0.002	0.006	<0.002
Molybdenum	350	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Nickel	20	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28
Selenium	1.0	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Silver	5	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
Thallium	7.0	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Vanadium	24	0.21	0.09	0.34	0.42	0.47	0.52
Zinc	250	0.80	0.47	0.86	0.44	0.64	1.2

(1) STLC values from California Administrative Code Title 22, Chapter 30, Article 11, Section 66699.

All tests were run using Method 6010, except Mercury and Selenium, which used Method 7470 and 7740 respectively.

TABLE 4.6-2

SOLUBLE INORGANIC PERSISTENT AND BIOACCUMULATIVE SUBSTANCES MINE WASTE

CH$_2$M Hill Laboratory Results
(milligrams per liter)

		Lookout Pit			Providence Pit		
Constituent	TTLC (1)	Waste LW-1	Leach LHC-1	Mill LMC-1	Waste PW-1	Leach PHO-1	Mill PMO-1
Antimony	500	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Arsenic	500	98.1	134	136	25.2	34.6	39.0
Barium	10000	13	24.6	43.5	33.6	34.9	98.9
Beryllium	75	0.4	0.4	0.4	0.6	0.8	0.9
Cadmium	100	<0.4	<0.4	<0.4	<0.4	<0.4	0.7
Chromium	2500	6.1	17	69.5	3.3	4.2	57.0
Cobalt	8000	3.7	<1.4	2.9	1.7	2.8	<1.4
Copper	2500	14	15	17	5.5	8.6	12
Flouride	18000	61.3	35.6	49.7	96.9	75.0	96.2
Lead	1000	<6.0	9.6	<6.0	7.4	13	46.2
Mercury	20	0.84	0.67	0.91	0.70	2.5	5.04
Molybdenum	3500	2.1	1.8	1.5	1.6	2.1	1.3
Nickel	2000	<2.8	<2.8	3.8	<2.8	<2.8	<2.8
Selenium	100	<8	<8	<8	<8	<8	<8
Silver	500	2	10	25.1	<1.4	4.5	17
Thallium	700	<8	<8	<8	<8	<8	<8
Vanadium	2400	23.0	17	18	18	23.0	19
Zinc	5000	24.4	22.3	19	37.6	44.8	100

(1) TTLC values from California Administrative Code Title 22, Chapter 30, Article 11, Section 66699.

All tests were run using Method 6010, except Flouride, Mercury, and Selenium for which Methods 340.1,2, 7470 and 7740 respectively were used.

with total sulfur content below the statistical mean, the results of the static tests (Table 4.6-3) may not represent the overall acid generation potential of the waste rock.

Sample LWMC-1 was the only sample with a total sulfur content higher than the mean value and it exhibited a low acid generation potential. The total sulfur content of this sample is substantially lower (5.7 times) than the maximum value of total sulfur (2.32 percent) detected in the waste rock.

The subtraction of maximum potential acidity (based on total sulfur) from the gross neutralization potential yields the "net neutralization potential "(NNP)". Theoretically, a sample can be expected to generate net acidity at some point in time if the NNP is less than zero. However, based on general experience, values of NNP in the range of -20 and +20 tons of $CaCO_3$/1000 tons of sample may be considered to have the ability to generate net acidity (SRK 1989).

For the samples presented in Table 4.6-3, the NNP for each sample is calculated by subtracting total sulfur content in tons $CaCO_3$/Kiloton (Kt) from the acid neutralizing potential in tons $CaCO_3$/Kt. This calculation produces negative NNP values for samples LWC-1 (-0.4) and LWMC-1 (-1.0), indicating a net acid generating potential.

In addition, the acid neutralization potential determined from the static test results in Table 4.6-4 (DKP 1990d), indicate low acid neutralizing potential. Therefore, it is essential to determine the acid generating potential of any high sulfur material within the waste rock profile during mine operations and before deposition to the waste rock dump.

Surface water impacts from the waste rock dump are considered to be of low significance based on the testing performed by DKP (1990). However, the mitigation measures presented in Section 4.2.6.3 should be implemented to monitor and prevent the occurrence of potential ARD from the waste rock dump.

Sediment - A cumulative watershed analysis (FES 1991a) was completed to examine the quantity of sediment that the disturbed areas of the site would produce. The study concluded that the sediment loading in the Preston Canyon drainage when compared to pre-mining conditions, would slightly decrease during active mining due to the use of sediment detention ponds, and slightly increase after mining if detention ponds are reclaimed. Detention ponds used to collect sediment from upgradient catchment areas disturbed by mining activities will be left to function after mine closure, or until regulatory water quality criteria is satisfied. Sediment loading for the Indian Spring drainage would remain virtually the same for pre-mining, active mining, and post-mining conditions. The magnitude of sediment induced by mining is less than five percent and is not considered significant by the time the drainages reach Willow Creek. See Section 4.2.6.5 for further discussion.

TABLE 4.6-3

STATIC TEST RESULTS

Western Atlas International
A Litton/Dresser Company

CORE LABORATORIES

LABORATORY TESTS RESULTS

08/28/90

JOB NUMBER: 901219 CUSTOMER: DENVER KNIGHT PIESOLD ATTN:

SAMPLE NUMBER: 1 DATE RECEIVED: 08/20/90 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AMAX GOLD SAMPLE: PWC-1 REM:

SAMPLE NUMBER: 2 DATE RECEIVED: 08/20/90 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AMAX GOLD SAMPLE: LWC-1 REM:

SAMPLE NUMBER: 3 DATE RECEIVED: 08/20/90 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AMAX GOLD SAMPLE: LWOC-1 REM:

SAMPLE NUMBER: 4 DATE RECEIVED: 08/20/90 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AMAX GOLD SAMPLE: LWSC-1 REM:

SAMPLE NUMBER: 5 DATE RECEIVED: 08/20/90 TIME RECEIVED: 10:00 SAMPLE DATE: / / SAMPLE TIME: :
PROJECT: AMAX GOLD SAMPLE: LWMC-1 REM:

TEST DESCRIPTION	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5		UNITS OF MEASURE
Total Sulfur (as S)	<0.01	0.09	0.02	0.06	0.41		%
Pyritic Sulfur (as S)	0.02	0.08	0.02	0.05	0.31		%
Sulfur, Unidentified (as S)	<0.01	0.01	<0.01	0.01	0.10		%
Sulfate Sulfur (%)	<0.01	<0.01	<0.01	<0.01	<0.01		%
NPP/Peroxide (as S)	<0.01	<0.01	<0.01	<0.01	0.20		%
Total Sulfur (Tons CaCO3/Kt)	<0.3	2.8	0.6	1.9	12.8		Tons CaCO3/Kt
Pyritic Sulfur, (Tons CaCO3/Kt)	0.6	2.5	0.6	1.6	9.7		Tons CaCO3/Kt
NPP/Peroxide (Tons CaCO3/Kt)	<0.1	<0.1	<0.1	<0.1	6.2		Tons CaCO3/Kt
Acid Neutralizing Potential	7.8	2.4	5.0	2.6	11.8		Tons CaCO3/Kt

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TABLE 4.6-4

ACID GENERATION POTENTIAL
MINE WASTES USED IN HUMIDITY CELL TESTS

Core Laboratories' Results

Test	PWC	LWC	LWOC	LWSC	LWMC
Neutral Potential (1,4)	7.8	2.4	5.0	2.6	11.8
Potential Acidity (2,5)	<0.1	<0.1	<0.1	<0.1	6.2
Net Difference (3)	7.7	2.3	4.9	2.5	5.6
Total Sulfur (%) (5)	<0.01	0.09	0.02	0.06	0.41

(1) Tons of $CaCO_3$ equivalent in 1000 tons of material.
(2) Tons of $CaCO_3$ required to neutralize 1000 tons of material.
(3) Excess tons of $CaCO_3$ in 1000 tons of material.
(4) Method Number 3.2.3.
(5) Method Number 3.2.11.

Groundwater

Computer simulations performed by HSI were used to determine the potential impacts to the groundwater system due to pumping. A seven year mine life was examined. Data collected during pump testing and the HSI computer simulation indicate the impacts to the groundwater system based on the proposed eight year operational life are not significantly different from those based on seven years. The following discusses drawdown estimations generated by computer simulations by HSI using a mine life of seven years.

The impacts to groundwater from the waste rock dump, tailings impoundment, and heap leach pad are of low significance. However, if the design does not perform as expected, groundwater could be impacted by infiltration of solutions containing heavy metals processing reagents and waters of low pH.

Over time, inflow of run-off water from precipitation events to the pit could cause a slight buildup of dissolved solids. Because the quantity of groundwater encountered during exploratory drilling has been minimal, and the depth to regional groundwater is considerable, the potential for accumulated dissolved solids infiltrating from the pit to groundwater is anticipated to be non-significant.

Impact to Regional System - To evaluate the localized effects of groundwater drawdown due to pumping on the regional aquifer system in the Bunselmeier Spring and Preston Canyon areas, a computer simulation model (GAA 1986) was run by HSI, analyzing production wells PW-2B and PW-3D. A conservative pumping rate of 1,000 gallons per minute (gpm) was used for each model run, and groundwater drawdown levels were calculated for the pumping well location and for the general area surrounding the well.

Computer modeling for the Bunselmeier Spring area indicates that after pumping one production well (PW-2B) for seven years at 1000 gpm, drawdown would be approximately 78 feet. Changes in groundwater elevation at distances greater than two miles were calculated to be less than 58 feet of drawdown. Modeling also indicates the best design to minimize negative impacts for a water supply near Bunselmeier Spring is a well field consisting of three wells spaced approximately one mile apart. By using this type of well field, there will likely be little or no effect on the regional groundwater system. This impact is not considered significant.

Calculations for the Preston Canyon area predict that after seven years of groundwater extraction from well PW-3D, drawdown would be less than 23 feet. Changes in groundwater elevation at distances greater than two miles were calculated to be less than six feet of drawdown. The results of the modeling indicate little or no effect to the regional groundwater system in the Preston Canyon area during the evaluated seven-year period of pumping.

A recharge volume was estimated by SRK, to examine the potential effect of continual pumping on the quantity of groundwater presently stored within the aquifer in the vicinity of the Bunselmeier Spring area. A range of values are presented based on different precipitation values. These numbers illustrate the potential impacts for "best" and "worst" case precipitation conditions.

The estimated volume of recharge in the Bunselmeier Spring area is based on a mean annual precipitation range between 14 to 16 inches, an estimated infiltration rate of 30 percent over the basin area 25 square miles and an estimated porosity value of 0.30. These estimated values are based on field measurements from other mining locations in California which have hydrogeologic characteristics similar to Hayden Hill. Using these parameters, calculations indicate a recharge range of between 5600-6400 acre-feet per year. The projected volume of pumping at 1000 gpm is 1600 acre-feet per year.

Bunselmeier Spring calculations show a net recharge (pumping minus estimated recharge) of approximately 4000-4800 acre-feet per year. Therefore, the aquifer system probably will be in a net recharge situation during the eight years of mining operations, indicating little or no effect to the regional groundwater system is anticipated in the Bunselmeier Spring area.

Based on the analyses of the extent of water table drawdown and percentage of stored water removed due to pumping, sustained pumping of about 1000 gpm from the Bunselmeier Spring area is possible. Pumping for the duration of the Project should not significantly affect groundwater quality or quantity in the area.

The estimated volume of recharge in the Preston Canyon area is based on the same mean annual precipitation range, infiltration rate, and porosity values as those used for Bunselmeier Spring, but the basin area used for calculations is over 16 square miles. Using these values, calculations show a range of recharge between 3600-4100 acre-feet per year. The values show a net withdrawal (pumping minus estimated recharge) of about 2000-2500 acre-feet per year.

Impact to Shallow Local System - Drilling data indicate Bunselmeier Spring is part of a shallow groundwater system which is separate from the regional aquifer, and the two systems appear not to be in direct hydraulic contact with each other (HSI 1990). Upper Preston Canyon springs are recharged from groundwater migration northward from beneath the higher plateau near Hayden Hill. After discharging from these springs, water migrates down-canyon as part of shallow groundwater, not the regional groundwater system. Groundwater pumping from the deep regional aquifer is not anticipated to affect the springs and seeps.

However, as pit operations continue, minor seeps in near proximity to the pit will be affected. The springs and seeps located to the north, south and southeast of the pit are part of the local perched groundwater system. The secondary porosity features, faults and fractures, controlling the seeps, may be intercepted as the pit is excavated. The fractures acting as water conduits may be disturbed, thereby stopping the flow of shallow groundwater to the springs and seeps. The local perched aquifer recharge area will also be affected by pit excavation and may affect seeps farther away from the pit, such as Bunselmeier Spring. Water flow quantities from these fracture systems are expected to be low in the vicinity of the pit based on the low flows observed during exploratory drilling. This impact is not considered significant.

The flows from major springs in the area, such as Daisy Dean and Indian Springs, are not anticipated to be affected by pit operations. The springs are located in areas hydrogeologically separated from the minor seeps and springs around Hayden Hill.

4.2.6.3 Mitigation Measures for Water Resources

Regulatory Framework

The CWA is administered by the EPA, which delegates authority to the State Water Resources Control Board and, ultimately, to the CRWQCB. The CRWQCB will regulate Project systems which have the potential to discharge liquids to surface or subsurface waters. The review and permitting process will follow requirements of the California Administrative Code, Title 23, Subchapter 15, Article 7 (Mining, Waste Management), and the California Porter-Cologne Water Quality Act of 1985.

The CWA also delegates authority to the EPA and the State Water Resources Control Board to implement and enforce the NPDES Permit regulations for storm water discharges as specified in 40 Code of Federal Regulations (CFR) parts 122,123 and 124, p.47990-48091. Under this regulation, the CRWQCB will require a storm water discharge permit for discharge points receiving precipitation run-off which comes in contact with any overburden, raw material, intermediate product, finished product, byproduct, or waste located on the Project site.

The waste rock dump will require a storm water discharge permit. The heap leach pad and the tailings impoundment should not require a permit because they are zero discharge facilities. However, the Applicant may choose to permit these facilities for the unlikely event of a release. Any disturbed area, such as access roads, detention ponds and processing facilities may require a storm water discharge permit as regulated by the CRWQCB.

In compliance with applicable regulations, the CRWQCB will require, the use of materials and implementation of procedures, to safely contain liquids in order to achieve the zero discharge system proposed for the Project. These requirements will include:

- Synthetic liners for process solution ponds and heap leach pads;
- Sealed drainage and collection facilities for transport of leaching solution;
- Diked leach pads to confine and control drainage from the leach piles:
- Solution ponds with adequate freeboard to safely contain storm run-off from within the heap leach system and drainage of solution from the leach pads in the event pumps could not operate because of a power failure;
- Drainage or diversion ditches outside the heap leach system to preclude entry of storm run-off into the system;
- A leakage detection monitoring system for the leach pads and ponds;
- Regularly prepared monitoring reports reflecting the current status of operations; and
- Neutralization of the heap leach piles and tailings, and elimination of the solution ponds at the time of abandonment.

A permit will be required from the CDFG in accordance with Fish and Game Code (Sections 1601-1607) if construction is to divert, obstruct, or change the natural flow of a stream or wash where an existing fish or wildlife resource will be substantially affected.

Cyanide Requirements for Cyanidation Process Wastes - The CRWQCB is required to issue waste discharge requirements for mining operations that utilize cyanidation processes in the recovery of gold and silver. These requirements are intended to protect the environment from adverse impact due to cyanide-containing wastewater and solid waste.

Cyanide generally encountered in the cyanidation mine effluents and slurries are classified into three groups: 1) Free cyanide, 2) simple cyanides, and 3) complex cyanides. The simple cyanides and complex cyanides can dissociate chemically to release free cyanide. Free cyanide is highly toxic and, therefore, the CRWQCB requires stringent control of its discharge. Control of the discharge is attained by setting concentration level standards on a site specific basis.

The CRWQCB will issue waste discharge requirements for both the liquid and solid fractions of the mining waste. Requirements for the cyanide in liquid fraction are warranted because of the potential to easily migrate to ground and surface waters. Requirements for the cyanide in solid fraction are needed because the material may be worked into surface waters and become subject to leaching by precipitation.

The CRWQCB will require the solid and liquid fractions of the cyanidation process wastes be detoxified prior to discharge to the tailings impoundment. In the Proposed Action, the cyanidation process wastes will be detoxified prior to placement using the INCO process of cyanide destruction.

In general, the CRWQCB uses, as a guideline, the following concentration levels for most cyanidation process wastes (CRWQCB 1987).

PROCESS WASTE FRACTION	PARAMETER	CONCENTRATION
Liquid (barren solution effluent or the liquid fraction of slurries)	Total Cyanide	1.0 mg/l
	WAD Cyanide	0.5 mg/l
Solid (heap leach process tailings or solid fraction of slurries)	Soluble WAD Cyanide	0.5 mg/kg
	Soluble Total Cyanide	2.5 mg/kg
	Total Cyanide after extraction of Soluble WAD and Total Cyanide	10.0 mg/kg

Site specific discharge requirements will be determined by the CRWQCB after review of actual test results presented by the Applicant.

Mitigation Measures to be Incorporated Into Project Design

Water Use Requirements - Mitigation measures for water consumption by the mine should include:

- The amount of groundwater extracted from the production well field shall be recorded by metering the total flow volume pumped from the wells.

- The static groundwater level for the pumping and monitoring wells near the production well field shall be measured on a quarterly basis and reported to the BLM. If the amount of drawdown in the Bunselmeier Spring monitoring wells exceeds the 78 foot estimate discussed in Section 4.2.6.2, prior modeling of the well field shall be reevaluated using aquifer properties and drawdown data collected from the actual pumped wells to ensure that predictions of no noticeable affect to groundwater remain valid.

- A similar drawdown monitoring plan shall also be implemented for the Preston Canyon area if it is used.

Although the possibility of ponding of surface and groundwaters in the pit is remote, the following mitigation measures may be necessary:

- Accumulated pit water may be used in dust suppression activities or used for mill make-up water.

- Should chemical sampling of pit water indicate a significant degradation of water quality, a pit dewatering system would then be designed and installed.

- Accumulated pit water may require treatment prior to discharge to natural drainages. The monitoring and testing procedures for this would be covered by the NPDES permit.

Waste Rock

Waste rock produced during the operation shall be monitored on an on-going basis (as determined by the Geochemical Sampling and Contingency Plan) to ensure that acid rock drainage will not result.

- The Draft Geochemical Sampling and Contingency Plan (GSCP) located in Appendix M, was developed for the Project to provide a means by which the operator can demonstrate and ensure acid rock drainage will not be produced by characterizing the waste rock through geochemical testing. The GSCP will be finalized and approved by the BLM and the USFS prior to issuance of their Records of Decision and will be consistent with the CRWQCB waste discharge requirements. The final GSCP will incorporate detailed methods for sampling and monitoring the waste rock produced, including sampling location and frequency, data base development, methods of analysis, and remedial treatment measures to be implemented should potential acid generating material be identified.

The GSCP is designed to address fluctuations in geochemical characteristics in materials mined from the Hayden Hill deposit. It establishes the action to identify and mitigate against potential generation of acid or metal-rich leachate beyond certain set points from materials generated by mine development. The plan is structured to be consistent with the Project Mitigation Compliance Program prepared for Lassen County in December of 1990, but shall be dynamic and subject to revision as data and experience with the plan are gained.

Geochemical testing will indicate the potential of the waste rock materials to produce ARD. The Applicant has committed to continue testing of waste products during mining (DKP 1990e and Appendix M).

If testing of the waste rock indicates areas within the ore zone with a potential for ARD production, these wastes should be treated by the operator according to GSCP. Acid production shall be monitored, contained, and treated using best available technology (BAT) identified in the GSCP.

Sediment loss from the waste rock dump can be minimized through:

- Selection of the complete benching alternative. (This alternative has other negative impacts to other resource areas.)
- Reduction of soil and sediment loss from the waste rock dump would occur by thorough revegetation upon reclamation.
- Long-term sedimentation impacts to the Preston Canyon drainage can be mitigated by building sediment detention facilities downgradient of the waste rock dump.

Tailings Impoundment - The proposed tailings impoundment design specifies a single liner containment system with provisions for a leachate collection and return system. As with the waste rock dump, mitigation measures shall include:

- Compliance with the GSCP. The GSCP addresses procedures to be followed if the Proposed Action treatment alters the physical and chemical characteristics of the tailings significantly from those tested by DKP (1990e). The GSCP outlines a long-term treatment scenario using BAT. (See Appendix M.)

Heap Leach Pad - Mitigation measures for the heap leach pad will be the same as those for the tailings impoundment including:

- Compliance with the GSCP.
- Major and/or minor drainages that will be restricted by heap pad construction should be diverted around the heap piles. (This revised reclamation plan addresses this mitigation measure.)
- Post-operation of the heap leach pad will include detoxification of the spent ore materials to meet CRWQCB standards. (This revised reclamation plan addresses this mitigation measure.)

General Project Site - The following mitigation measures apply to the overall Project site in general:

- All sedimentation control devices installed in on-site drainages will be checked for blockage bi-monthly. Any debris or sediment that inhibits the proper function of the surface drainages will be removed immediately by the Applicant.

- Reclamation activities shall include interim and final control of slopes on cuts and fills, plus revegetation to control surface erosion, sheet flow, and sediment loading. After operations cease, the functional ability of all sediment control structures will be monitored and maintained on a semi-annual basis, or as appropriate.

The Applicant has committed to perform continuous surface and groundwater sampling of water quantity and quality throughout the life of the Project (see Figures 2.2-6 and 3.1-1).

- The sampling should be performed as stipulated by CRWQCB in waste discharge regulations and permits. The CRWQCB will specify a frequency of sampling events and may expand the current list of analytical parameters. The water quality monitoring plan is outlined in the Quality Assurance Project Plan report and its amendment, prepared by DKP (1990b and 1991). Appendix K presents the specifics of the water quality monitoring program for both surface and groundwater sampling as outlined by DKP (1991). The details of the water quality monitoring program are further discussed in the DKP water quality monitoring report (DKP 1991).

- The installation of nine additional monitoring wells as stated by the Applicant (DKP 1990e) should be completed (see Figure 2.2-6 for locations).

- These nine additional monitoring wells should be included in the Project water quality monitoring program.

The Applicant has also committed to re-routing springs and seeps, to the extent feasible, that are intercepted during construction of ore processing facilities (DKP 1990e).

- Drains will be constructed to route the seepage waters away from the construction.

- If necessary, an infiltration gallery could be used, downstream of the Project to return these re-routed waters to the subsurface (DKP 1990e).

4.2.6.4 Unavoidable Adverse Impacts to Water Resources

Project water consumption would mean that a portion of the water in the deeper regional aquifer would not be available for other activities or development until aquifer recovery through natural recharge was complete, following Project closure. This impact is not considered significant.

Flow from the minor seeps located in near proximity to the pit areas will likely be diminished. These minor flows are local and may impact local wetlands (see Section 4.2.4, Wetlands). This impact is not considered significant.

4.2.6.5 Cumulative Impacts to Water Resources

Cumulative Watershed Effects (CWE) Analysis

The following excerpt is from the CWE Analysis prepared by FES (FES 1991a).

Watershed Sensitivity

"Natural watershed sensitivity has been determined for 54 watersheds within the Modoc National Forest. Watershed sensitivity criteria are based on nine soil characteristics: soil depth; hydrologic soil group; erosion hazard rating; soil K-factor; available waterholding capacity; soil parent material; water runoff potential; soil textural class; and soil climatic zone."

"Sensitivity ratings have not been established for many of the subbasins within the Modoc National Forest including Preston Canyon and Indian Spring. Watershed sensitivity ratings used with the Chatoian CWE method were generated using the rating system developed by Jones (1982). Watershed sensitivity ratings used in this study of the Preston Canyon and Indian Springs subbasins were generated using the method described in Haskins (1986)."

Threshold Levels for Cumulative Watershed Impacts

"Thresholds of Concern (TOC) have been established for the major watersheds in the Modoc National Forest including Willow Creek. Certain subwatersheds such as the Preston Canyon, Letterbox Canyon, and Indian Spring subbasins have not been separately evaluated; consequently established thresholds are not available. These smaller subbasins are second and third order watersheds and are typically evaluated by USFS for project planning purposes. The potential for cumulative watershed impacts to occur is greatest within the second and third order watersheds rather than the larger watersheds (USDS Forest Service, 1987)."

"The Willow Creek watershed is rated as moderately sensitive and is given a TOC rating of 12 percent. The TOC rating represents a percentage of the level of impacts generated by equivalent roaded acres

(ERA's). The TOC percentage does not necessarily represent the point of cumulative watershed impacts, but is meant to indicate an increased susceptibility for adverse cumulative impacts within a watershed."

Watershed Analysis

The magnitude of difference in run-off and sediment induced by mining and baseline conditions is less than 5 percent in terms of cumulative impacts to the Willow Creek drainage. Cumulative watershed impacts are the additive effects of land disturbing activities on downstream resources. Cumulative watershed impacts are most commonly manifested as altered sedimentation and erosion processes in stream channels. These processes can produce impacts such as channel scour, deposition, streambank failure, mass wasting, and flooding which can have detrimental effects on downstream fish habitat, riparian habitat, reservoir life expectancy, soil productivity, visual quality, and other beneficial uses (FES 1991a).

To quantify cumulative watershed impacts from the Proposed Action, three scenarios were examined: 1) No mining and no timber sales, 2) no mining with timber sales, and 3) mining with timber sales. Calculated watershed impacts, expressed in ERAs (equivalent roaded acres), appear to be less than the threshold of concern for sediment loading for the Preston Canyon and Indian Spring drainages under all three scenarios.

Two sub-basins, Preston Canyon and Indian Spring, within the Willow Creek drainage will be influenced by the Proposed Action (See Figure 3.6-1). The Preston Canyon sub-basin drains approximately 5,295 acres including the west side of Hayden Hill. The Preston Canyon drainage was further divided into six smaller sub-basins as shown on Figure 3.6-1. The Indian Spring sub-basin has a catchment area of approximately 4,174 acres and was further divided into three sub-basins.

Facilities affecting the Preston Canyon sub-basin include a portion of the Lookout and Providence zones of the pit (105 acres), the waste rock dump (206 acres), a growth media storage area (7 acres), and 12 acres of haul and access roads (Figure 2.2-1). The Indian spring sub-basin will be affected by a portion of the Lookout zone (4 acres), and 9 acres of roads. The remainder of the 950 acres associated with mining activities consist primarily of the heap leach pad and tailings impoundment located in the unconfined portion of the Silva Flat sub-basin which lacks a single, well-developed drainage.

Run-off and sediment generation for the mine facilities areas and the effects on the local drainages were evaluated for average annual conditions and for a 100-year/24-hour storm event. The drainage basins have been modeled to represent pre-mining, active mining, and post-mining (reclaimed) conditions. The SEDCAD computer program was used to predict the run-off and sediment yields for the storm condition. SEDCAD is a relatively recent PC adaptation of SEDIMOT which utilizes standard SCS and modified Universal Soil Loss Equation (USLE) techniques.

Based on the SEDCAD results, the following general conclusions can be stated for the stream condition:

1. A slight decrease in run-off and sediment yield is observed during mining for the Preston Canyon drainage because of the operational use of sediment detention ponds;

2. A slight increase in run-off and sediment yield is observed for post-mining, for the Preston Canyon drainage if sediment ponds were abandoned and reclaimed;

3. Run-off and sediment yield for the Indian Spring drainage is virtually the same for pre-mining, active mining, and post-mining;

4. Run-off and sediment yield from the waste rock dump are decreased by as much as 30 percent by the addition of the Complete Benching Alternative; and

5. The magnitude of difference in run-off and sediment induced by the mine is not significant (less than 5 percent) in terms of cumulative impacts to the Willow Creek drainage.

The average annual sedimentation impact at Willow Creek, based on USLE calculations, is indicated to be essentially unaffected by mining or by the various post-mining configurations. This conclusion is largely the result of the approximate nature of the USLE approach. Minor variations in slope and component areas do not produce commensurate changes in the sediment yield quantities when using the gross approximations of the USLE methodology.

In summary, the results of the watershed analysis indicate that cumulative effects from mining operations will not be significant.

4.2.7 Air Quality

4.2.7.1 Issues, Concerns and Opportunities

Issues and concerns related to air quality are listed below:

1. How will air quality in the Project vicinity be affected by Project activities?

2. What will the quantity of emissions be?

3. **Could acid rain be a by-product of cyanide solution evaporation at Hayden Hill?**

4. **Is cyanide drift during strong wind conditions a potential impact to water quality?**

In regard to issues 1 and 2, the following information provides an estimate of the emission quantities for all pollutants emitted. The emissions for the pollutants of greatest interest were modeled and the impacts estimated. The impact estimates were compared with the ambient standards. For emissions that are small, impacts were not modeled because they will clearly be within standards. Issues 3 and 4 are addressed in Section 4.2.7.5.

4.2.7.2 Regulatory Framework

Every operation associated with the Proposed Action will have some level of impact on air quality. To discuss impacts to air quality and to quantify a level of significance requires some criteria by which to compare the impacts. For this analysis, legal air quality standards are used as the criteria.

There are two types of air quality standards; absolute and incremental. The absolute standards are limits not to be exceeded by the sum of the impacts of all sources plus baseline and include the National Ambient Air Quality Standards (NAAQS) and the California Ambient Standards. These are listed in the third and fourth columns of Table 4.7-1.

The incremental standards are not to be exceeded by any single source or source group. The incremental standards are from the Clean Air Act of 1977 which also requires that no area suffer "significant deterioration". Significance was defined for three classes of areas. Class I areas have a small allowance for deterioration, Class II areas have a larger allowance, and Class III, the largest. National Parks and Wilderness areas are Class I areas. Most of Lassen County and the area within a 42 mile radius of Hayden Hill is a Class II area. The incremental "significant deterioration" standards for Class II areas are listed in the fifth column of Table 4.7-1. For the purposes of this analysis, the incremental standards were used to quantify "significance" of impact. The absolute standards must also be met, but because baseline concentrations in the Hayden Hill area are low, the incremental standards are more restrictive.

It is shown in the following subsection that the emissions of concern from the Proposed Action are particulates less than 10 micrometers in aerodynamic diameter (PM10) and nitrogen dioxide (NO_2). Incremental standards exist for these two pollutants. For pollutants without incremental standards, such as carbon monoxide (CO), ozone (O_3), and lead (Pb); emissions that will result in less than a 10 percent impact on the absolute ambient standards are considered insignificant.

TABLE 4.7-1

NATIONAL AND LOCAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Period	National Standards	California Standards	LCAPCD (Class II) Standards
PM10	24-hour	150 μg/m^3 (1)	50 μg/m^3	27 μg/m^3 (2)
	annual	50 μg/m^3	30 μg/m^3	19 μg/m^3 (2)
Sulfur Oxides	1-hour–		655 μg/m^3	
	3-hour	1,300 μg/m^3 (1)	–	512μg/m^3 (2)
	24-hour	365 μg/m^3 (1)	131 μg/m^3	91 μg/m^3 (2)
	annual	80 μg/m^3	–	20 μg/m^3 (2)
Hydrogen Sulfide	1-hour	–	42 μg/m^3	
Nitrogen Dioxide	1-hour	–	470 μg/m^3	
	annual	100 μg/m^3	–	25 μg/m^3 (2)
Carbon Monoxide	1-hour	40 mg/m^3 (1)	23 mg/m^3	
	8-hour	10 mg/m^3	10 mg/m^3	
Ozone	1-hour	235 μg/m^3	180 μg/m^3	
Lead	30-day	–	1.5 μg/m^3	
	quarter	1.5 μg/m^3	–	

(1) not to be exceeded more than once per year

(2) incremental standard

The California Air Resources Board (ARB) has promulgated several regulations concerning toxic and hazardous emissions, which are designed to limit in various ways exposure of the public to toxic pollutants. Some address emission levels rather than ambient impacts and address pollutants that will not be emitted by the Proposed Action. The "Air Toxic 'Hot Spot' Information and Assessment Act of 1987" requires the Lassen County Air Pollution Control District (LCAPCD) to compile a list of health risk information on exposure to toxics for the public. This requirement includes an assessment of risk to the public health in the vicinity of the facility. This information is not required until the operating phase of the Project.

The LCAPCD has a nuisance rule which implicitly regulates other pollutants; Air Pollution Regulations, Rule 4:2. The nuisance emission rule is as follows:

> "A person shall not discharge from any source whatsoever such quantities of air contaminants or other materials which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such persons or the public or which cause or have a natural tendency to cause injury or damage to business or property."This rule may be interpreted to restrict ambient concentrations of pollutants, such as toxic and hazardous pollutants, until other standards are in place. Toxic emissions from the Project area may include small amounts of hydrogen cyanide (HCN), mercury and crystalline silica. There are no ambient standards for these materials but their impacts were estimated and compared with Occupational Safety and Health Administration (OSHA) workplace standards. These standards follow:

OSHA Standards for the Workplace

Mercury	1.0 mg/m^3
Crystalline silica	10.0 mg/m^3
Hydrogen cyanide	11.0 mg/m^3

Lassen County limits mercury emissions to 0.55 lbs/day (Rule 6:4a.1). Federal regulations require that facilities emit no more than 2300 mg of mercury per 24 hour period.

In addition to the absolute and incremental standards, there are also air regulations limiting emissions, regardless of the degree of impact. For example, the LCAPCD has an opacity standard, Rule 4:0, to which the dust emissions from the Project will be compared. The standard limits opacity to a Ringlemann number of 2. The National New Source Performance Standard for Metallic Mineral Processing limits opacity from the crusher to 10 percent.

The LCAPCD Rule 6:4 requires the application of best available control technology (BACT) to all process sources. This rule also allows the LCAPCD Officer the discretion to require offsets for the emissions under certain conditions.

All national and LCAPCD standards are to be met by the Proposed Action. The plans for compliance must be developed and submitted in the process of applying for an Authority to Construct (ATC), and proof of compliance must be shown before receipt of the Permit to Operate (PTO). These permits are issued through the LCAPCD. These emission standards are not discussed herein.

4.2.7.3 Impacts

The air impacts from the Hayden Hill Project were estimated using an ARB-approved atmospheric dispersion model, ISCLT. Model inputs included 239 days of measured distribution of wind speeds by direction and stability, summarized in Section 3.7, and the estimated emissions. The emissions were estimated from information provided by LGMI on the schedule and rates of activity for all the air emission sources, and emission factors (emissions per unit of activity) found in the technical literature. Further discussion of impacts can be obtained in "Technical Report, Air Impact Analysis, Hayden Hill Project" by Air Sciences (1991a), available for review at the Lassen County Planning Department.

The emissions would consist of: Fugitive particulates (PM10) from preproduction earthmoving activities; mining and hauling; fugitive PM10 from crushing; combustion gases; and PM10 and gaseous emissions from processing. (The PM10 particulates will be partially composed of crystalline silica, a toxic substance.)

Preproduction activities will encompass the construction of the buildings, process plant, leach pad, tailings dam, haul roads, and growth media removal and stockpiling. Large quantities of dirt and growth media will be moved. The mining sources include drilling, blasting, ore and waste rock loadout, and hauling. There will be PM10 emissions from the crushing, screening, conveying of ore, and wind erosion.

The combustion sources include, primarily, the mobile machinery used in the mining and hauling, and, secondarily, the process heaters. Particulates and other gases will be emitted from the carbon regeneration kiln, the doré furnace, the cyanide leach circuit, and the mercury retort. There will be no power generation on site. The blasting will emit NO_2, CO and aeromatics. The estimated emission rates and sources of each pollutant are shown in Tables 4.7-2 through 4.7-4.

Tables 4.7-2 and 4.7-4 include columns for controlled and uncontrolled emission rates. Mobile mine machinery is fueled by diesel; there are no supplemental emission controls on this equipment. Therefore mobile equipment emission rates in Table 4.7-3 are uncontrolled.

TABLE 4.7-2

ANNUAL PARTICULATE PM10 EMISSION SUMMARY

Process Emissions Source	Process Rate (tons/yr)		Uncontrolled Emission Factor (lb/ton)	Emission Rate (lb/yr)	Control Factor (%)	Controlled Rate (lb/yr)
Primary crusher	6,058,000	tons	0.0500	302,900	95	15,145
Secondary crusher	6,058,000	tons	0.1000	605,800	95	30,290
Tertiary crusher	6,058,000	tons	0.1600	969,280	95	48,464
Lime silo loading	15,145	tons	0.2400	3,635	99	36
Lime silo discharge	15,145	tons	0.0400	606	0	606
Heap leach conv.	4,780,000	tons	0.0600	2868,000	95	143,400
TOTAL						237,976

Mining Emissions Source	(units/yr)		(lb/unit)			
Drilling	60,000	holes	0.4680	28,080	90	2,808
Blasting	626	blasts	18.0000	11,268	30	7,888
Truck loading	17,500,000	tons	0.0015	25,924	30	18,147
Waste discharging	11,442,000	tons	0.0015	16,950	0	16,950
Stockpile discharge	1,514,500t	tons	0.0015	2,244	0	2,244
Crusher loading	6,058,000	tons	0.0015	8,974	95	449
Road emissions	396,526	VMT	6.6426	2,633,947	75	658,487
Waste rock erosion	60	acre	650.6009	39,036	0	39,036
Bulldozing	12,520	hours	3.1774	39,781	0	39,781
TOTAL						785,789

Yearly Process and Mining PM10 Emissions (Controlled)	1,023,594

TABLE 4.7-3

ANNUAL COMBUSTION EMISSION SUMMARY

Source	CO (lbs)	HC (lbs)	NO_2 (lbs)	SO_x[(1)] (lbs)	PM10 (lbs)
Mobile:					
Off highway truck	168,457	18,029	391,187	10,658	24,038
Wheeled loader	10,742	4,695	35,494	855	3,230
Bulldozer	22,461	2,404	52,158	1,089	2,066
Miscellaneous	10,352	2,331	25,935	548	2,132
TOTAL	212,012	27,459	504,775	13,150	31,466
Process:					
Regen kiln	1,566	126	6,264	455	136
Solution heater	986	79	3,942	286	86
Mercury retort	80	6	321	23	7
TOTAL	2,632	212	10,528	764	229
GRAND TOTAL	214,644	27,671	515,302	13,914	31,695

(1) Based on a California diesel sulfur limit of 0.05 percent in diesel fuel. Currently California limits sulfur to 0.25 percent in diesel fuel.

TABLE 4.7-4

ANNUAL SUMMARY OF OTHER EMISSIONS AND CONTROL FACTORS

Source	Process Rate (units/yr)		Emission Factor (lb/unit)	Uncontrolled Rate (lb/yr)	Control Factor (%)	Controlled Rate (lb/yr)
Explosives (CO)	3,500	tons	67	234,500	0.0	234,500
Explosives (NO_2)	3,500	tons	17	59,500	0.0	59,500
Dore furnace (PM10)	70	tons	100	7,000	99.5	35
Leach circuit (HCN)	8,760	hours	21.6	189,216	0.0	189,216

4.2.7.4 Mitigation Measures Included as Part of the Proposed Action

There are mitigation measures designed into the Proposed Action. Because the mitigation measures will be an integral part of the operation, they are discussed herein and applied before the expected emissions and impacts are calculated. The mitigation measures utilized by the Project will include BACT, in conformance with the Lassen County Air Pollution Regulations (Hansen 1991a). The mitigation measures are described below.

- When possible during construction, the earthmoving activities will be routed on designated haul roads and dust generation from these roads will be controlled with water.

- Dry drilling emissions will be 90 percent controlled either by bag-filter collection, cyclone collection, or with water spray. There are no emission controls available for blasting, loadout, or bulldozing in the pit. However, after the initial ground-breaking the mine activity will be below ground level, and partially protected from winds that assist in PM10 generation. The effect of this "wind shadow" will be to decrease in-pit emissions by about 30 percent.

- Emission controls for hauling will include chemical dust control on the haul roads, such as magnesium chloride and water, to maintain a control level of at least 75 percent (75 percent of emissions are eliminated). Control on the access road will be the same as the haul roads if there is dusting from vehicles. Interim revegetation of exposed areas no longer in use, such as waste rock dump lifts and haul roads, will be implemented to minimize wind erosion.

- The crushing system, including drop points, screens and truck dump pocket, will be controlled with a sonic fogger system in conjunction with wind fences if necessary. Conveyer drop points will be controlled with water sprays. A 95 percent control is anticipated for the crusher system. The lime silo loading emissions will be 99 percent controlled with a baghouse.

- All stationary sources are fueled by propane which is a clean fuel (and considered a control measure in itself). Mobile mine machinery is fueled by diesel, and emissions will be controlled to the levels required by the California vehicle emission and fuel requirements. California law requires diesel fuel to contain no more than 0.25 percent sulfur; therefore, sulfur oxides (SO_x) emissions will be negligible. The vehicles will contain the pollution control devises installed by the manufacturer. To further minimize particulate and CO emissions, the engines will be kept in tune through a regular preventative maintenance program.

- The doré furnace emissions will be 99.5 percent controlled with a baghouse. The carbon regeneration kiln will have no control but the PM10 emissions (less than 1/2 kilogram [kg] per hour) are considered negligible. Combustion emissions from the retort furnace, the carbon regeneration kiln furnace and the solution heaters furnace will be routed through a baghouse.

- The mercury retort is an efficient mercury emission control device, and therefore negligible mercury emissions of less than 1 milligram (mg) per hour are anticipated. To ensure Federal emission standards are met, LGMI will be required to perform a source test on the mercury retort. This test can only be performed after the mercury retort is in full operation.

- Hydrogen cyanide emissions from the leaching process will be minimized by maintaining the leach solution at a high pH.

4.2.7.5 The Impact Analysis

The impact analysis focused on PM10 and NO_2 because these are the pollutants with impacts greater than 10 percent of the standard and, therefore, have the greatest chance of being significant. Annual impacts of these two pollutants were estimated because the ambient standards are on an annual basis. There is also a 24-hour PM10 standard. The PM10 impacts were not examined on a 24-hour basis because the methods of estimating emissions, control effects, and modeling are imprecise for fugitive dust sources such as mines on a 24-hour basis. It is assumed that if the annual incremental standards are met, the 24-hour standards should also be met.

The dispersion analysis was performed using 239 days of on-site meteorologic data (see Section 3.7.1). This is less than the recommended one complete year necessary for a representative model. However, in a mountainous area such as the Hayden Hill site, the wind patterns are dominated by terrain effects. The on-site conditions cannot be approximated with regional data sets. Therefore, the 239 days of actual on-site data is better than a year of off-site data.

During preproduction earthmoving activities, PM10 generation cannot be controlled, and the 24-hour California PM10 standards may be exceeded. However, earthmoving projects are similar to the overlotting for development of housing subdivisions and are temporary, lasting generally less than three months.

The test for significance was applied at the limit of public access to the mine activities, which is the fenceline surrounding the operation. It is at this fenceline that the impacts will be largest because the sources are at surface level. The impacts will decrease with distance from the property.

TABLE 4.7-5

ESTIMATED MAXIMUM ANNUAL IMPACTS FROM THE HAYDEN HILL MINING ACTIVITY

Pollutant	Calif. Standard ($\mu g/m^3$)	Lassen county Standard ($\mu g/m^3$)	NAAQS Standard ($\mu g/m^3$)	Maximum Impact ($\mu g/m^3$)	Location
PM10	30 [1]	19 [1]	50	13.0	Southeast of Providence Zone
NO_2	100	25	100	21.3	Southeast of Providence Zone

[1] geometric mean

Particulates (PM10)

Impacts were calculated using the EPA- and ARB-approved ISCLT dispersion model. The estimated PM10 particulate impacts at various locations on the fenceline around the Project site are shown on Table 4.7-5 and Figure 4.7-1. Note that these concentrations are annual arithmetic means and can only be compared to the PM10 standards after conversion to geometric mean. The arithmetic mean conversion to geometric mean is approximately 0.92. Results from the modeling effort show that, at the location of maximum impact, south of the pit and east of the crusher, the arithmetic mean is 13.0 micrograms per cubic meter ($\mu g/m^3$). This maximum impact concentration is within the California standard of 30 $\mu g/m^3$. It also does not exceed the incremental standard of 19 $\mu g/m^3$ geometric mean. The sum of baseline concentration levels and source impacts equals 31 $\mu g/m^3$ as an arithmetic mean. This is well below the NAAQS standard of 50 $\mu g/m^3$.

With surface-level sources, impacts are at a maximum at the source and decrease with distance from the source. In the analysis, the particulate impacts decrease to 10 $\mu g/m^3$ about 100 meters from the boundary, downwind of the maximum impact location. The area of impact above 10 $\mu g/m^3$ is restricted to about 10 acres beyond the fenceline to the southeast.

Nitrogen Dioxide (NO_2)

Impacts of NO_2 were also modeled. The annual maximum impact would be 21.3 $\mu g/m^3$, well under the California and NAAQS standards of 100 $\mu g/m^3$, and below the incremental standard of 25 $\mu g/m^3$. The impacts, compared with standards, are shown in Table 4.7-5. The location of the maximum NO_2 impact, 21.3 $\mu g/m^3$, is the same as the maximum PM10 impact. Nitrogen dioxide impacts are much lower at other boundary locations.

Hydrogen Cyanide (HCN)

Hydrogen cyanide impacts from the cyanide leach solutions are ratioed from those of NO_2: HCN emissions are about one-third of the NO_2 emissions. As an annual average approximation, the HCN impacts will be one-third of those of the NO_2 impacts, or about 7 $\mu g/m^3$. To make this annual impact comparable with a maximum 8-hour OSHA standard, it is multiplied by 14, an EPA-accepted approximation. Thus the highest HCN impact is approximately 100 $\mu g/m^3$ adjusted to an 8-hour maximum. This is one percent of the OSHA standard of 11.0 milligrams per cubic meter (mg/m^3). As with PM10 and NO_2, the HCN impacts will decrease rapidly with distance from the source. More importantly, cyanide heap leach operations have been in existence at many locations, and there are no recorded permanent health effects on employees working beside and on the leach pads where HCN concentrations will be highest. At more distant locations, off the mine property, the concentrations will be lower.

Regarding the possibility of acid rain formation from HCN, HCN naturally degrades to ammonia and carbon dioxide within several hours of its generation. The degradation is enhanced with sunlight. Any ammonia that is not removed by interaction with the ground or vegetation, could form a weak basic solution if adsorbed in precipitation. The solution will form a base, not an acid, and could tend to neutralize any acid that might be present.

There will be a small amount of sodium cyanide leach solution drift during strong winds. "Drift" refers to the cyanide leach solution carried downwind beyond the leach pad by strong winds as the solution is being sprayed on the pad. Drift is a phenomenon of interest primarily with cooling towers where air flows counter-current with water to attain high evaporation and cooling.

The wind pattern measured on site indicates, during eight months of the year, the highest percentage of strong winds (above 10 knots) come from the south. The strongest winds would carry any leach solution drift north and across the mine site, rather than off-site. Even if this were not the case, drift is not a concern. With leach systems the nozzles are designed to produce large water droplets and minimize evaporation. The spray patterns are horizontal and low to the ground. Winds cannot carry large droplets any appreciable distance and wind speeds decrease with decreased distance to the ground. For all of these reasons, there would be very little drift. The minor concentrations of cyanide contained in the spray drift would degrade relatively rapidly to form ammonia and carbon dioxide, so that which drifts is unlikely to affect water quality, plant or animal life.

Other Toxic and Hazardous Pollutants

Other pollutants of concern include mercury, crystalline silica, hydrochloric acid (HCl), sodium hydroxide (NaOH), and aldehyde. Aldehyde will not be used or emitted by the Project. The remaining pollutants are discussed below.

Mercury - Mercury emissions will be less than 1 mg per hour and less than 1 lb per day, so the impacts will be negligible in comparison with Federal, County, and OSHA workplace standards.

Crystalline silica - Crystalline silica is a natural component of rock throughout the West. Even if the PM10 were composed of 100 percent crystalline silica, impacts from the Proposed Action, plus baseline, would total 31 $\mu g/m^3$ annually. This is 0.3 percent of the OSHA workplace standard. Less than half the PM10 particulates from the baseline and operations is expected to be composed of silica, and concentrations are likely to be about 0.1 percent of the OSHA standard.

Hydrochloric Acid - The HCl is used to wash the carbon from the regeneration kiln. It is delivered by bulk tanker and stored in closed 5000 gallon tanks. The carbon is stripped under a closed pressure system, thus none of the vapors from the HCL will be emitted to the atmosphere. Should a spill occur, HCL is neutralized by soda ash in accordance with the SPCC and ERP, Appendix L.

Sodium Hydroxide - The NaOH is delivered by truck tanker and is transferred to bulk storage 1000 gallon tanks. The NaOH is used in a closed system, thus vapors will not be emitted to the atmosphere.

4.2.7.6 Indirect Impacts

Offsets

To maintain air basin quality in an attainment area, offsets may be required. Offsets are actual, annual enforceable emission reductions from existing sources, sufficient to offset all anticipated annual emission increases as calculated according to Lassen County Rule 6:6, associated with a new source. Offsets are required within a 15 mile radius if certain daily emission standards are exceeded. It is anticipated that the Project will exceed the following standards:

Lassen County Offset Threshold Levels

PM10	150 lb/day
NO_x	250 lb/day
CO	550 lb/day

The Applicant attempted to find areas off-site to perform improvements to offset NO_x, CO and PM10 emissions from the Project site (Hansen 1991b).

PM10 - To offset PM10 emissions, LGMI investigated the untreated dirt roads in the Hayden Hill area. The roads are administered by the County and USFS. It is USFS policy that roads are not improved without a specific reason for improvement, such as a timber sale, after which it may be required to return the road to the access level it was previous to the improvement. In addition, CDFG has historically opposed the application of chemical dust suppressants on roads due to impacts to wildlife.

However, it was possible for LGMI to identify areas for improvement. Proposed off-site improvements follow:

- Reconstruction of County Road 534 (Hayden Hill Road) to "unpaved rural street" standards per Lassen County Code, which requires an all weather surface and certain grade and width standards be met.

- Shaping and surfacing of portions of USFS Road 38N42, the road to the Bunselmeier well field along the pipeline corridor.

- Use of dust suppressants on the mine site and on all roads used in mine operations by LGMI and contractors when permitted by the responsible agencies.

- Enforcement of speed restrictions by LGMI on employee and contractor vehicles on all roads to and from the mine site. To reduce traffic, van pools to and from the Project will be provided for employees.

Nitric oxide - Offset potential for NO_x is limited to the cogeneration facility at Big Valley Lumber Company near Adin. No other facilities are within a 50 mile radius. LGMI proposed to provide Big Valley Lumber Company with equipment to improve their emissions. The lumber company declined, citing the fact that they are within all agency requirements and recent improvements of operational strategies.

The BACT is in place on all equipment proposed for the Hayden Hill Project, which are sources for NO_x. In addition, NO_x emissions will be minimized to the extent possible through regular equipment maintenance.

Carbon Monoxide - Offset potential for CO is the same as for NO_x. To improve emissions of CO at the Big Valley Lumber Company, LGMI proposed to provide fuel drying equipment to dry fuel. The company declined, citing the fact that the improvement has not been proven to be effective in their specific operations, and recent reductions to fuel moisture content utilizing strategies other than fuel drying equipment.

The use of BACT and complete maintenance on Project equipment will minimize CO emissions to the fullest extent possible.

Other Indirect Impacts

There will be minor indirect impacts from the increased use of Hayden Hill Road by employees and supply vehicles, and from any housing development in the vicinity of the new power service. The number of vehicles on the access road will be minor. With dust control, the PM10 emissions will be only a fraction of those generated on site, which are expected to be insignificant in impact. There may be visible dust over the access road during times of shift change when the vehicle activity is greatest. These impacts are not considered significant.

The greatest impact from rural housing is generally from woodburning in the November through February period. There is now a national emission standard for new wood stoves so these impacts would be controlled well below levels experienced with stoves constructed before July, 1990. Woodburning impact becomes of general concern only with high-density housing, similar to winter resorts. This is not expected to be a significant issue in the rural setting along the power corridor route. This impact is not considered significant.

4.2.7.7 Mitigation Measures

Legal air quality standards are used as the criteria to identify impacts to air quality due to the Hayden Hill Project and to quantify a level of significance. Emissions from the Hayden Hill Project will not exceed State or Federal ambient air quality standards and the mine will operate within Air Quality permit requirements. Therefore, impacts to air quality are not considered adverse or significant.

Air quality standards exist for PM10, SO_x, hydrogen sulfide (H_2S), NO_2, CO, O_3, Pb vinyl chloride and sulfates. There would be no emissions of vinyl chloride. Sulfur oxides, H_2S and Pb would be emitted by the Proposed Action, but only in negligible quantities. Carbon monoxide emissions will result in a less than 10 percent impact on the absolute ambient standards, and are considered insignificant. Ozone is a byproduct of reactive hydrocarbon emissions and is not a concern in rural areas because of the rural atmospheric chemistry. Sulfates are a byproduct of SO_2, which emission rate is negligible.

Particulates and Nitrogen Dioxide

The pollutants that will be emitted by the Proposed Action which have the greatest chance of being significant are PM10 and NO_2. Results from dispersion modelling show that, with the emission control measures designed into the Proposed Action, the maximum impact concentrations of both PM10 and NO_2 will be within air quality standards.

The dispersion modeling of PM10 and NO_2 was performed with 239 days of on-site meteorologic data. The on-site conditions cannot be approximated with regional data sets. However, there are also seasonal effects on the meteorology and without a full year, it is not certain that all seasons are properly represented. Even so, a substantial change in PM10 and NO_2 impacts are not anticipated. No additional mitigation measures are needed.

It may be a condition of the PTO to perform a dispersion analysis using a full year of meteorologic data. If required, this analysis would have to be completed within 90 days to one year after commencement of operations, using actual on-site emission data. The results of this analysis would be a model of the actual impacts rather than a projection.

Offsets

The mine will exceed LCAPCD standards for offsets. LGMI investigated all known possible sites to perform offsets to Project emissions of PM10, NO_x, and CO within a 15 mile radius of the Project site. LGMI has proposed offsets for PM10, however, offsets available will result in little air quality benefit. In addition, no offsets for NO_x and CO are available within a 15 mile radius. The only source within a 50 mile radius declined LGMI's offer for equipment to reduce NO_x and CO emissions. No other mitigation is possible.

The Air Pollution Control Officer may exempt a source from offset requirements. A source that may qualify for offset exemption is one that will not cause or contribute to a violation of an ambient air quality standard or lead to the violation of established emissions increments. The exemption is possible if the offsets will result in little or no air quality benefit, if emissions offsets are not available, or if the offsets will not be cost effective.

Emissions from the Hayden Hill Project will not violate State or Federal ambient air quality standards and the mine will operate within air quality permit requirements. It is not a violation if offsets result in little or no air quality benefit, or if offsets are not available. In addition, exemptions of offset requirements are possible. Therefore, the exceedence of LCAPCD standards for offsets is not considered an adverse impact.

Toxic and Hazardous Pollutants

Emissions of mercury, crystalline silica, and HCN, toxic and hazardous pollutants, were estimated and compared to OSHA workplace standards. With the mitigation measures designed into the Proposed Action, emissions from these pollutants will be 1 percent or less of the OSHA standards. No additional mitigation measures are needed.

Other pollutants of concern include aldehyde, HCl and NaOH. Aldehyde will not be used or emitted by the Project. The HCl and NaOH will not be emitted to the atmosphere. No additional mitigation measures are necessary.

4.2.7.8 Unavoidable Adverse Impacts

Due to mitigation measures planned by the Proposed Action described above, there will be no unavoidable adverse impacts to air quality.

4.2.7.9 Cumulative Impacts

No other emission sources exist or are proposed in the area. Therefore, no significant cumulative impacts have been identified for air quality.

4.2.8 Socioeconomics

4.2.8.1 Issues, Concerns, and Opportunities

The issues and concerns related to socioeconomics are listed below:

1. What will be the economic benefits of the Proposed Action to the area of influence?

2. What will be the impacts to the existing infrastructure of the area of influence?

3. What will be the impacts to housing in the area of influence?

4. What will be the impacts to property values due to the Proposed Action?

The economic benefit to the area of influence, Issue 1, is discussed in Section 4.2.8.8. Issue 2 is addressed in this Section 4.2.8, Socioeconomics. Infrastructure impacts are addressed in the education, local government facilities and services, and local government fiscal impacts sections.

Issue 3, housing impacts are discussed in Section 4.2.8.5. Issue 4, the impacts to property values, is discussed in Section 4.2.8.8 under the sub-heading, Property Taxes on Impact Housing. Socioeconomic mitigation measures are outlined in Section 4.2.8.10.

4.2.8.2 The Impacts Analysis

This section discusses the potential effects of the proposed Hayden Hill Project on socioeconomic conditions within the area of influence. Socioeconomic conditions considered in this analysis include employment, population, housing, education, water and sewer services, law enforcement, fire protection, solid waste and local government fiscal conditions. This section also considers the potential for induced development and population growth along the proposed power line corridor and the potential socioeconomic effects of such growth. Further discussion of impacts can be obtained in the "Socioeconomic Technical Report in Support of the EIR/EIS for the Hayden Hill Project" by Planning Information Corporation (1991), available for review at the Lassen County Planning Department.

In order to analyze potential effects of the Project, assumptions have been made concerning certain aspects of the Project. These include: The number (or share) of Project operations workers who will be drawn from the existing workforce; the size of the households associated with operations workers; the amount of induced employment generated by the Project; the distribution of Project workers and their families to nearby communities; and the amount of ad valorem and sales taxes that will be paid by the Project. These assumptions were developed using a combination of experience from other areas, the opinions of knowledgeable local officials, standard socioeconomic methods and professional judgement. While this is not a "worst-case" analysis, in most cases these assumptions are conservative; that is, they are developed to test the effects of greater rather than lesser impacts.

4.2.8.3 Employment Impacts

Pre-Production Activities

Pre-production activities will be performed by LGMI and professional contractors managed by LGMI. Many of these activities (e.g., site clearing, road construction, fencing, overburden removal and building construction) can be performed by contractors who are located in Lassen, Modoc and Shasta counties. Assembly of the crushers, mill and gold recovery complex will require contractors with capabilities not available locally (Born 1990). Many of the pre-production activities would be short-term and sequential. It is estimated that a maximum of 150 workers would be on the site during the pre-production phase (HHOC 1989b). The pre-production phase will be approximately three-months long, depending on weather conditions.

Operations

LGMI projects that labor demand during operations will total 210 full-time equivalents (FTEs). Of this total, 25 percent are estimated to be supervisory, professional and support, 55 percent are estimated to be operating personnel, and the remaining 20 percent would be maintenance personnel (see Section 2.2.9). Of the 210 FTE total, LGMI would transfer approximately 30 employees from other Amax operations, because their skills are not available locally. Of this total, 15 have already been transferred (Johnson 1990).

Induced Employment

The Hayden Hill Project will result in additional basic income in the area. Recent estimates of a Lassen County job multiplier for the California Correctional Center (another basic employer) are 1.32 or 0.32 induced jobs for every basic job. These estimates were derived from the USFS ImPlan input-output model. Multipliers from the same source for Lassen County's only existing extractive industry, sand and gravel quarries, range from 1.22 for a local multiplier to 1.54 for a regional multiplier. We have assumed a job multiplier of 1.40 for this analysis (Goldman 1990b).

4.2.8.4 Population Impacts

The population associated with the Hayden Hill Project would be dependent on the number of workers that would be drawn from the local labor force and the size of the households associated with both Project and induced workers. Estimates of total population are allocated to communities within the area of influence.

Population Associated with the Pre-Production Workforce

Many of the individual activities that will occur during the construction phase are short-term in nature. There is potential for many of these activities to be performed by local contractors (from Susanville, Alturas or Burney) who would commute daily, or regional contractors (from Reno, Redding, or Klamath Falls) who would commute weekly and seek temporary housing near the work site during the week. A few highly specialized activities associated with construction of the crusher, mill and gold recovery facility will require contractors and workers with skills not available locally. Again, given the relatively short-term nature of these activities, few construction workers would relocate families. Therefore, demands on local government facilities and services would be minimal. Because the location of construction contractors is currently not known, accurate projections of population associated with the pre-production phase of the Project are not possible. However, this assessment does address the housing demand and transportation effects associated with pre-production activities.

Locally Hired Operations Workers

For this analysis, a locally hired worker is defined as a person living within commuting distance of the Hayden Hill Project at the time of employment on the Project who continues to keep his or her place of residence after employment.

As noted above, LGMI estimates that of a total labor force of 210, about 30 jobs will require skills or experience that will not be available locally. Consequently, the 180 workers could conceivably be drawn from the local labor pool.

There are three factors that will determine the number of locally hired workers. These are; the presence of qualified workers in the local labor pool, the willingness of those workers to apply for Hayden Hill jobs, and the willingness of LGMI to hire workers from the local labor pool and to ensure those workers are local.

The fact that on July 1, 1990 (several months before Project operations are scheduled to begin), LGMI had received 366 applications for employment (95 of which were from the area of influence) illustrates local interest in the Project (Johnson 1990). The Applicant is committed to hiring local workers and is in the process of developing a local hiring policy at the time of this analysis (Johnson 1990).

After analyzing the hiring rate of a recent, large-scale construction project in Lassen County, we have assumed a 53 percent local hiring rate for the Project. Clearly, the potential for LGMI to achieve this rate or an even higher rate exists. The pivotal variable in achieving this rate is the strength of LGMI's local hiring policy and the ability and willingness to implement it. A local hire rate of 53 percent for the operations workforce of 210 would result in 110 locally hired workers and 100 non-local or immigrating workers, including the 30 to be transferred from other AMAX projects.

Locally Hired Induced Workers

For the purpose of this analysis, it is assumed that induced jobs are created in the communities where project workers live. In Bieber and Adin where the commercial and service sectors are relatively small, it is assumed the few induced jobs created by the Project would be filled from the local labor pool. In Susanville and Alturas, where larger commercial, service and government centers exist, we have assumed 50 percent of the induced jobs would be filled from the local labor pool.

Household Size

Because the Hayden Hill Project will contain more families of child-rearing age than the general population, we have assumed a household size of three persons per household.

Population Projections

Based on the foregoing assumptions, the Hayden Hill Project would generate an incremental population of 365 persons at full operations. These 365 persons would be the estimated total population associated with the non-local or immigrant workers. Population associated with locally hired workers (except for non-local/induced workers) are not estimated for this analysis.

Population Distribution

Project workers make residential location decisions based on proximity to the work site, available affordable housing, and the amenities associated with a particular location. Rental housing is in scarce supply in every community within the area of influence; however, there are vacancies in mobile home parks, (particularly in Alturas and Susanville, and to a lesser degree Adin), there are a number of homes for sale, and an inventory of parcels on which homes can be built or an approved mobile home can be located. Each community within the primary and secondary areas of influence offers amenities of different varieties. Adin and Bieber offer a rural lifestyle and less expensive housing. Susanville and, to a lesser degree Alturas, offer the commercial, service, medical, and entertainment amenities corresponding to their larger population. The Applicant has committed to providing transportation from each of these areas if demand develops. Fall River Mills and the Eagle Lake area, because of the relatively high cost of the primarily recreation and second-home housing in these areas (and because of current waste water disposal problems in the Eagle Lake area), are not anticipated to receive substantial

TABLE 4.8-1
POPULATION DISTRIBUTION ASSOCIATED WITH FULL OPERATIONS WORKFORCE

Community	Incremental Population	Households
Susanville	172	57
Alturas	55	18
Adin	79	26
Bieber	60	20
Total	**365**	**121**

Source: Planning Information Corporation.

Note: Columns may not add due to rounding.

growth from the Project. Population was distributed to the Susanville, Alturas, Adin and Bieber areas based on a simple gravity model. Table 4.8-1 displays the manner in which this model would distribute the incremental population to these communities at full production of the Hayden Hill mine.

There are several factors that could influence the manner in which Project employees distribute themselves. Chief among these is the availability of housing. The distribution of Project workers would reflect the location of any significant number of reasonably priced housing units that become available through development or outmigration of existing residents.

It is unlikely that all of the incremental population associated with the Project will choose to locate within communities. Given the large amount of land in both Lassen and Modoc counties and the ability to develop well and septic systems, and locate mobile homes on foundations on relatively small parcels, there is a potential for some proliferation of isolated rural residences (Lassen County Planning Department 1986). Although potential impacts associated with such development are discussed in subsequent sections, this analysis does not project the quantity of rural development that might occur,largely because of the difficulty associated with arriving at accurate estimates of location, given the large amount of land available for rural development.

4.2.8.5 Housing Impacts

The following impact analysis serves as the housing impact analysis required the Resource Plan.

Pre-Production Activities

Because most of the pre-production activities are relatively short term, employees of contractors associated with these activities will require temporary housing, such as rental housing, apartments, mobile home spaces (particularly those set up to accommodate recreational vehicles) and hotel and motel rooms. Advertised rental houses and apartment units are in short supply. At the time of this analysis there were 192 mobile home pads and an average of 75 motel rooms available in summer months and an average of 318 motel rooms available in the winter.

Given that the peak workforce for pre-construction activities is 150 workers, and that many of these workers likely will be local residents and commute daily to work from their homes, it is reasonable to assume that the temporary housing resources in the Susanville, Alturas and the Big Valley area can accommodate the housing demand generated by the workforce associated with pre-production activities at the Hayden Hill Project.

Susanville and Alturas, the sites of most temporary housing, are 58 and 55 miles from the Project site, respectively. Consequently, construction workers may choose to camp or locate recreational vehicles on public lands, particularly during summer months. There is a particular concern for the USFS Willow Creek Campground which is located on State Highway 139, just south of the Hayden Hill turnout (Bouse 1990). Both the USFS and BLM have 14-day limits for camping. However, campers who reach the 14-day limit can legally move to another campsite for 14 days (Bouse 1990; Teeter 1990). There is a possibility that widespread occupying of developed campsites by construction workers would reduce the amount of those resources available for other visitors. The widespread occupancy of undeveloped campsites for extended periods could result in damage to wildlife habitat, vegetation, and surface water resources. This is discussed in Section 4.2.13.2, Impacts to Recreation.

__Operations__

According to Table 4.8-1, the operations phase of the Hayden Hill Project would generate an additional 57 households in the Susanville area, 20 in Bieber, 26 in Adin and 18 in Alturas. For the purpose of this analysis it is assumed that each household will create a demand for one housing unit. This may be an overestimation in that it is possible some single Project workers might share housing and some spouses of Project workers might take induced jobs.

It is reasonable to assume that many hourly workers would initially seek rental housing and apartments or situate mobile homes on pads in mobile home parks or on residential lots. This may also be the case for salaried workers, although they would be more likely than hourly workers to purchase homes (McFarlan 1990).

The estimated 57 households who would locate in Susanville would exacerbate an already tight housing market in the Susanville area. There is potential for additional housing to be developed before Project operations begin.

The estimated 20 households who would locate in Bieber would likely find existing housing scarce, although additional rental units would come on the market if there were an increased demand (O'Brien 1990; McFarlan 1990). It is probable that many of the estimated 20 households would either have to build new housing or place mobile homes on lots in Bieber.

The estimated 26 households who would locate in Adin potentially could situate mobile homes on 20 units of the 34-pad mobile home park that is slated for construction, if those pads are still available at the time Project operations begin. As in Bieber, immigrating residents could also build new housing or place mobile homes on lots.

Alturas could easily accommodate the estimated 18 households who would locate there in the 67 mobile home pads available at the time of this analysis. Alturas also had 40 houses for sale at prices significantly below those in Susanville (see Table 4.8-2).

TABLE 4.8-2

ANNUAL PROJECT DIRECT PROPERTY TAXES

	Taxes	Allocation Per AB 8 Factors				
	Paid (1% Rate)	Lassen County	Big Valley Schools	Lassen College	County School Svcs	Building Fund
1992-99	$500,000	$200,000	$213,000	$51,000	$36,000	$1,000

Source: Hayden Hill Operating Company, 1989; Planning Information Corporation.

TABLE 4.8-3

ANNUAL PROJECT-DIRECT SALES AND USE TAXES: LOCAL RATE (1%)

	Revenues		Distribution		
	Construction	Operations	Total	County	Susanville
1991-92	$215,000	$176,000	$391,000	$354,000	$37,000
1993-99		176,000	176,000	150,000	26,000
Average	$215,000	$176,000	$203,000	$176,000	$27,000

Sources: Boster, Brett, 1990; and Planning Information Corporation.

TABLE 4.8-4

ANNUAL PROJECT-DIRECT SALES AND USE TAXES: TRANSPORTATION RATE (1/4%)

	Revenues		Distribution	
	Construction	Operations	Total	County
1991-92	$54,000	$44,000	$98,000	$98,000
1993-99		44,000	44,000	44,000
Average	$54,000	$44,000	$51,000	$51,000

Sources: Boster, Brett, 1990; and Planning Information Corporation.

In summary, that portion of the immigrating population associated with the operations phase of the Hayden Hill Project who desire to rent housing will very likely have difficulty finding existing housing in any of the four communities in the area of influence. Those desiring to situate mobile homes in parks will likely be accommodated in Susanville, Adin and Alturas. Those who seek to purchase or build a home or place a mobile home on a lot will be able to be accommodated in every community.

There is concern that the permanent housing created to serve Project-related demand in rural areas, such as Bieber and Adin, will not be needed after Project closure, and could result in excess housing in these areas (Sorvaag 1990).

4.2.8.6 Education Impacts

The purpose of this section is to project potential impacts of the proposed Hayden Hill Project on the four school districts within the area of influence. The analysis focuses on enrollment, school capacity and operating costs. Pupils associated with the Hayden Hill Project were estimated using a ratio of 0.39 elementary school students per family and a ratio of 0.28 high school students per family (HLA 1987).

The analysis presented below identifies impacts on operating costs in certain districts associated with increased enrollment. These costs stem from the fact that the formula established by the California Legislature for State and local funding does not cover total per student operating costs, and some of the other revenues on which the districts rely for funding of operations do not increase with increased enrollment. Therefore, the operating deficits accompanying increased enrollment are not unique to students associated with the Hayden Hill Project; they apply to all new students.

Susanville Elementary School District

The Hayden Hill Project is estimated to increase enrollment in the Susanville Elementary School District by 22 students. The district will construct a new elementary school in 1991-92 (the Meadow View School) which will be at capacity when it opens and the projected students would create demand for an additional classroom with all its attendant costs including one additional teacher. The district estimates that the additional Average Daily Attendance (ADA) funds, lottery revenues and certain other categorical funds which are scaled to enrollment from the State would cover additional salary costs, but not supplies, maintenance and operation expenses which would amount to an estimated total of $10,000 to $15,000 per year (Stone 1990). The business supervisor believes that the current budget cannot be stretched enough to cover the costs of the additional students and that programs would have to be trimmed to accommodate them (Stone 1990).

Lassen Union High School District

Because both schools operated by the district are now at or above capacity, 16 new students could not be easily absorbed into the system. Those new students would probably require the addition of a new classroom, a new teacher, part-time custodial work, additional supplies and transportation costs. The fully loaded cost of an additional teacher would be about $36,000; a quarter-time custodian would cost about $7,500. The business manager for the district estimates that the total cost to the district, beyond increased revenue from ADA, for operation and maintenance for the addition of 16 students would be about $20,000 to $30,000 per year (Grose 1990). The additional money required annually to serve 16 new students would come from the general fund. The business manager said that a number of funding sources are declining and that the institution of developer fees is being considered seriously. Funding facilities and equipment are the biggest problem for the district. The school board is committed to maintaining instructional programs and would have to contemplate cutting from other areas of the budget (Grose 1990).

Big Valley Joint Unified School District

The Hayden Hill Project would result in an increase in enrollment of an estimated 31 students in the Big Valley Joint Unified School District, including 18 in elementary grades and 13 in the high school. The district has capacity to accommodate an additional 74 students in the high school and 12 students at the middle school; however, the elementary school is currently at capacity. The district has plans to add two new class rooms at the elementary school and two at the middle school. If these classrooms are completed by the time the Hayden Hill Project reaches operation, the district would be able to handle the Project-generated increases in enrollment.

The Big Valley Joint Unified School District would receive an estimated average annual $213,000 in property taxes from the Hayden Hill Project (Table 4.8-2). However, as a result of the revenue limit per ADA, these property tax revenues would have the effect of decreasing State revenues rather than increasing the revenues available to the district.

Big Valley School District would receive about $248 per pupil less from ADA for operating and maintenance expenses than it requires. That means a shortfall of about $3,228 if 13 additional students enroll in the high school, and about $4,470 if 18 students enroll at the elementary school (Tillot 1990). Annual costs incurred for 31 additional students would come from the Forest Reserve Fund. Lottery money is usually spent on curriculum development, although it is not legally restricted to that use, and so could be used if the board decided that was necessary. The business manager for the district said that she believes programs would not be cut but, rather, funds would have to be found to provide for the additional students' education (Tillot 1990).

Modoc Joint Unified School District

The Modoc Joint Unified School District would receive an estimated increase in enrollment of 12 students from the Hayden Hill Project, 7 at the elementary level and 5 in the high school. The district currently has available capacity for 110 students in elementary grades, 15 students in the middle school and 27 students in the high school. However, the impact on the Modoc Joint Unified District of an increase in school population is dependent upon which grade level receives the increased enrollment. Another variable is overall enrollment which changes from year to year and from month to month.

The high school could accommodate five additional students within the increased revenue from the State. The elementary school would be able to absorb seven students without additional revenues beyond increased ADA funds if the students enrolled in certain grade levels, but not if they enrolled in others. In the worst case, if students enrolled in grade levels unable to accommodate them, a half-time teacher would need to be hired at a cost of $15,000 to $20,000. State funds would cover operation and maintenance costs that arise beyond salaries (Drennen 1990). Unfunded costs of educating the additional students would come from the general fund, a fund now stretched to its limit by all the programs which must compete for revenues. Assuming other enrollment figures stay the same, seven additional students probably mean that some programs would be cut back (Drennen 1990).

4.2.8.7 Impacts to Local Government Facilities and Services

This section projects potential facility and service impacts of the proposed Hayden Hill Project on the various local government facilities and services described in Section 3.8.7 through Section 3.8.12.

At the time of this analysis (third quarter 1990), Lassen County government is faced with a fiscal year 1990-91 budget that will require cutbacks of $1.8 million dollars. This may require eliminating 13 County employee positions, eliminating the library as a County-supported function, and a 30 percent reduction in County services, among other measures (Lassen County Times 1990b). Modoc County is faced with a similar situation and may eliminate 12 County positions (Townsend 1990). This analysis assumes that user fees for local government services (such as sewer and water) are designed to fund operating costs, unless otherwise noted.

Section 4.2.8.8 describes the ability of local governments to fund increases in services.

Lassen County

Lassen County facilities and services considered for this analysis include law enforcement and solid waste disposal. Potential effects of the County roads are discussed in Section 3.12. Health and emergency services and water and sewer services are discussed under the municipalities in which they are located.

The operational phase of the Hayden Hill Project would increase Lassen County population by an estimated 232 people.

The Lassen County Sheriff feels that the current level of staffing is inadequate and the department may lose five additional deputies in the next fiscal year because of budget constraints. The Sheriff believes that the current coverage of the Lassen County portion of the Big Valley area is inadequate. Even the relatively small additional population generated will add to the strain on County law enforcement services. The additional traffic on State Highway 139 and County Road A2 may result in additional demands for traffic enforcement and accident-response services, particularly during the pre-production phase of the Project. The new County jail, scheduled to be completed in July of 1991, would be adequate to accommodate the increase in population generated by the Project.

The Lassen County landfills at Bass Hill and Bieber have adequate capacity to accommodate the population associated with the Project. User fees will pay for operating costs, but not for the cost of siting new landfills or post closure costs.

City of Susanville

Susanville population would increase by an estimated 172 people as a result of the Hayden Hill Project. The Susanville Water Department and the Susanville Consolidated Sanitary District could accommodate the increase in population generated by the Project. The Susanville Police Department is currently understaffed, according to the chief; therefore, any increase in population adds to the already strained service conditions.

The chiefs of the Susanville Fire Department and the Susanville Fire Protection District both believe that their current equipment is inadequate; in addition, the Susanville chief feels that additional full-time staff is needed. Growth from any source exacerbates these conditions.

Lassen Community Hospital could accommodate the Project-related increase easily, although ancillary services and direct patient care might need to expand. The North Eastern Rural Center would also be able to accommodate the growth, although its equipment is not currently adequate.

Bieber

The town of Bieber would receive an estimated population increase of 60 persons. This number could be accommodated by Lassen County Water Works for both water and sewer services. The Big Valley Fire Protection District could also accommodate the growth. Law enforcement services, provided by the Lassen County Sheriff's Department, are currently thought by the sheriff to be inadequate. The Big Valley Medical Center (which serves both Bieber and Adin) has adequate staff for present needs, but its facilities are inadequate. According to the executive director, the center would have difficulty accommodating growth, although it should be noted that if all projected new Big Valley residents associated with the Project became patients of the center it would result in a four percent increase in the center's current patient load.

Modoc County

An estimated 134 person increase in population would occur in Modoc County as a result of the Hayden Hill Project. The Modoc County Sheriff believes that the current level of staffing for his department is inadequate. He feels that the staff is approximately 50 percent of optimum level and he will be losing two positions in the 1990-91 fiscal year. Consequently, even a small increase in population exacerbates these inadequacies. The Modoc County Jail should be adequate to handle Project-related growth with the expansion planned to be completed in 1991. The Modoc County landfills could accommodate the growth generated by the Project; however, only one-third of the costs associated with operating the landfills are covered by the user fees, according to the Modoc County Public Works Director. Therefore, population growth from any source represents a net operating loss for the landfills.

Adin

The Hayden Hill Project is estimated to generate a 79-person (i.e., 17.9 percent increase) population increase in the town of Adin (Young 1990). The sewer system operated by Adin could handle this estimated increased population, although the existing infiltration problem would be worsened. The Modoc County Sheriff's deputy stationed in Adin and the Adin Fire Protection District could both accommodate the Hayden Hill-related growth, according to officials from those agencies.

City of Alturas

With the addition of the estimated 55 people that Alturas would receive from the Hayden Hill Project, the city would still be below its 1985 population level. The water, sewer, law enforcement, fire protection and health service systems in Alturas should all be able to accommodate Project-related growth.

4.2.8.8 Local Government Fiscal Impacts

The Hayden Hill Project will generate increases in revenues and costs for Susanville, Lassen County, Alturas and Modoc County. The Project's fiscal impacts will be the difference between increased revenues and costs (i.e., the net revenue or cost) to each local government.

Jurisdictions

The primary relevant jurisdictions identified within the Project's area of influence are Lassen County government, the City of Susanville, Modoc County government, and the City of Alturas. Lassen County, of course, is the Project site County. Lassen and Modoc counties and the cities of Susanville and Alturas also are affected because impact population associated with the Project are likely to reside within these jurisdictions.

Other taxing entities (such as utilities or other special districts) would levy property taxes on the Project site or on impact housing. However, these entities are not given primary consideration in this section.

__Revenues__

Four revenues are considered in this section; property taxes generated directly by the Project, local sales and use taxes generated directly by the Project, property taxes generated by new housing purchased or rented by impact households, and other local revenues generated by the impact population.

__Project-Direct Property Taxes__ - The capital plant, equipment, and value of the mineral rights subject to production at the Hayden Hill Project would generate revenues at a basic County-wide rate limited to a maximum of 1 percent per year. The proceeds of the basic County-wide rate would be allocated to local agencies within the County by formula.

Property tax revenue estimates developed by the Project proponents (HHOC 1989b) and allocated according to factors for Lassen County tax-code areas 52001 and 52002 are presented in Table 4.8-2. Lassen County government and the Big Valley School District would receive significant Project direct property tax revenues.

__Project-Direct Sales and Use Taxes__ - The Hayden Hill Project will make expenditures subject to the 1 percent city-County sales-use tax rate during construction and operations. Expenditures for goods purchased out of state for delivery to the mine site will generate California use tax revenues for Lassen County.

Purchases made from vendors in Lassen County and in Susanville will generate sales taxes for the County or the city depending on where the sale takes place. Revenues from the 0.25 percent County transportation rate will accrue to County government for use in funding general transportation programs. Tables 4.8-3 and 4.8-4 present estimated Project direct revenues generated by sales taxes, use taxes and the local transportation rates.

These tables are based on the assumptions that 10 percent of total Project taxable expenditures would be subject to sales tax in Lassen County and 90 percent subject to use tax, that 5 percent of sales tax revenues will accrue to Susanville during construction, and that 15 percent of sales tax revenues will accrue to Susanville during operations.

Property Taxes on Impact Housing - Housing purchased by Project-related households will generate additional property tax revenues.

Estimates of these revenues depend on assumptions regarding the number of homes demanded by impact households by location, typical sales prices for housing purchased in each location, and estimated 1989-90 enrolled values for a typical undeveloped property in each location. The revenues are distributed according to allocation factors for representative tax-code areas in each housing location.

Property taxes generated by housing in Bieber would benefit Lassen County ($4,000 a year) and the Big Valley School District ($4,000 a year). Property taxes generated by housing in Susanville would benefit Lassen County ($11,000 a year), the City of Susanville ($9,000 a year), Susanville Elementary School ($9,000 a year), and Lassen Union High School ($7,000 a year). Property taxes from housing in Adin would benefit Modoc County ($6,000 a year) and the Big Valley School District ($6,000 a year). Property taxes from housing in Alturas would benefit Modoc Joint Unified School District ($4,000 a year), Modoc County ($3,000 a year), and the City of Alturas ($2,000 a year).

Other Local Revenues - The impact population would generate other local government revenues where they live, such as sales taxes on personal consumption and fees for use of public utilities and facilities. Also, additions to local population would trigger intergovernmental revenues distributed by per-capita formulas (e.g., motor vehicle license fees and cigarette and gasoline taxes). Table 4.8-5 presents annual total revenues, other than property taxes from housing, which would be generated by the impact population in Lassen County, Susanville, Modoc County and Alturas.

Costs

Average annual total costs incurred by Lassen County, Susanville, Modoc County, and Alturas to serve the impact population associated with the Project are presented in Table 4.8-6, which presents the average annual total costs for four relevant jurisdictions. The cost estimates reflect several general assumptions discussed below.

County Budget Crunch - It has been noted that Lassen County is facing a budget crunch which may require reductions in force across a number of County functions. The pressure to reduce discretionary local services has been growing as the State increasingly requires the expenditure of local funds to pay for State-mandated services and at the same time limits local government's ability to raise revenue.

This means, particularly in the case of Lassen and Modoc County governments, that the projected costs to serve impact populations, based as they are on recent historical costs, already reflect reduced levels of service imposed by the budget crunch.

TABLE 4.8-5

ANNUAL OTHER REVENUES GENERATED BY IMPACT POPULATION: LASSEN COUNTY, SUSANVILLE, MODOC COUNTY, ALTURAS

(Excludes Property Taxes on Impact Housing)

	Lassen County	Susanville	Modoc County	Alturas
Impact Population	232	172	134	55
Per Capita Operating Revenue	$ 752	$ 312	$ 1,326	$ 369
Total Annual Revenues (nearest $1,000)	$174,000	$54,000	$178,000	$20,000

Note: County government figures include incorporated and unincorporated areas.

Source: County of Lassen 1989-1990 Final Budget; City of Susanville Budget 1989-1990; Final County Budget of the County of Modoc, California, for the Fiscal Year Ending June 30, 1990; City of Alturas Budget Request Report (for 1989-1990); Planning Information Corporation.

TABLE 4.8-6

ANNUAL COSTS FOR SERVICE DELIVERY GENERATED BY IMPACT POPULATION: LASSEN COUNTY, SUSANVILLE, MODOC COUNTY, ALTURAS

	Lassen County	Susanville	Modoc County	Alturas
Impact Population	232	172	134	55
Per Capita Operating Costs	$ 955	$ 360	$ 1,644	$ 403
Total Annual Costs (nearest $1,000)		$222,000	$62,000	$220,000
$22,000				

Note: County government figures include incorporated and unincorporated areas.

Source: County of Lassen 1989-1990 Final Budget; City of Susanville Budget 1989-1990; Final County Budget of the County of Modoc, California, for the Fiscal Year Ending June 30, 1990; City of Alturas Budget Request Report (for 1989-1990); Planning Information Corporation.

TABLE 4.8-7

PROJECTED FISCAL IMPACTS ON LASSEN COUNTY GOVERNMENT

	Revenues						
	Project-Direct Property Tax	Project-Direct Sales-Use Tax	Property Tax From Impact Housing	Other Revenue From Impact Population	Total Revenues	Costs From Impact Population	Benefit/ (Cost)
1992	$ 427,000	$ 354,000	$ 14,000	$ 174,000	$ 969,000	$ 221,000	$ 748,000
1993	384,300	150,000	14,000	174,000	722,300	221,000	501,300
1994	341,600	150,000	14,000	174,000	679,600	221,000	458,600
1995	289,900	150,000	15,000	174,000	628,900	221,000	407,900
1996	256,200	150,000	15,000	174,000	595,200	221,000	374,200
1997	213,500	150,000	16,000	174,000	553,500	221,000	332,500
1998	170,800	150,000	16,000	174,000	510,800	221,000	289,800
1999	128,100	150,000	17,000	174,000	469,100	221,000	248,100
Average	$ 276,425	$ 176,000	$ 15,000	$ 174,000	$ 641,000	$ 221,000	$ 420,050
Cumulative	$2,211,400	$1,404,000	$121,000	$1,392,000	$5,128,400	$1,768,000	$3,360,400

Source: Planning Information Corporation.

Incremental Values Calculated from 1989-90 Base - Impacts identified in this analysis are based on data from the 1989-90 fiscal year. Because changes may occur in assessed value at the Project site or in jurisdiction fiscal conditions, impacts may be different if calculated using data from a base year later than 1989-90.

Fiscal Impacts Begin in 1992 - Impacts are assumed to take effect on or about March 1, 1992, an approximate start-up date for production at the Hayden Hill Project. It ignores the fact that specific elements of the Project may be placed on the supplemental roll as they are completed prior to start-up and that base year values may be established for, and taxes may be collected on, these elements at an earlier date.

Lassen County Fiscal Impacts

Lassen County would receive an impact population of 232 persons (77 households), 172 of whom would be expected to locate in Susanville (57 households) with the remainder in Bieber (20 households). Table 4.8-7 shows that for Lassen County, impact-generated revenues would exceed impact-generated costs throughout the life of the Project, yielding an annual average positive balance of about $420,050 and a projected cumulative positive balance of $3,360,400. The fiscal impact upon Lassen County reflects the overwhelming benefit to the County of the Project location in the unincorporated portion of Lassen County in terms of both property and the use tax portion of sales and use taxes.

Susanville Fiscal Impacts

In Susanville, with an impact population of 172 persons, or 57 households, impact-generated revenues would exceed impact-generated expenditures throughout the life of the Project, yielding an annual average positive balance of about $66,675 and a projected cumulative positive balance of $532,400 (Table 4.8-8). The net effect upon Susanville reflects the expectation that commercial establishments within Susanville will capture a significant proportion of direct Project purchases during construction and operation. Without the sales tax revenues from Project direct Property taxes and Project purchases, benefits and costs would be approximately equal.

Modoc County Fiscal Impacts

Modoc County would receive an impact population of 134 persons (44 households), 79 of whom would be expected to locate in Adin (26 households), with the remainder in Alturas (18 households). Table 4.8-9 shows that for Modoc County, impact-generated costs would exceed impact-generated revenues throughout the life of the Project, yielding an annual average net cost of about $33,000 and a projected cumulative net cost of $262,000. The fiscal impact upon Modoc County reflects the fact that Modoc County would not be expected to realize Project-direct revenues from either property or sales-use taxes.

City of Alturas Fiscal Impacts
In Alturas, which would receive an impact population of 55 (18 households), impact-generated revenues would approximately equal impact-generated expenditures throughout the life of the Project (Table 4.8-10). The expected fiscal effect upon Alturas reflects the expectation that although it would not be expected to capture any Project-direct revenues, Alturas's expected average operating costs would continue to be approximately equal to operating revenues.

4.2.8.9 Socioeconomic Impacts of Potential Induced Development Along the Power Line Corridor

The Lassen County Assessor's maps show 217 parcels of land not previously served by electricity lying within a mile of the corridor of the proposed transmission line to serve Hayden Hill. The parcels vary in size from less than an acre to over 1,000 acres. Zoning regulations, the County general plan, and practice of the Lassen County Board of Supervisors would allow six of those parcels to be developed in lots of 20 acres each; the remainder could be developed only in lots of 80 acres. These restrictions reduce the possibility of development sharply. County regulations concerning building within fire districts and Federal government ownership reduce the potential development further. Taking these factors into account, a maximum of 182 residential units could be built as a result of having electric service available for the first time. This means that the parcels have the potential of an induced population of between 450 and 550 persons.This potential proliferation of rural residential development would result in a corresponding potential for increases in many County services (road maintenance, law enforcement, emergency services, etc.) with associated increases in local government operating costs.

One impediment to development of parcels along the power line corridor (if it is owned and operated by Surprise Valley Electrification Corporation [SVEC]) is the cost of transforming the power from the transmission level of 69 kilovolts (KV) to the distribution level of 7.2 KV. The transformer, switches, site development and structures required to accomplish this could cost $100,000 to $500,000 or more. The substation at the mine will be owned by LGMI rather than SVEC, and so the transformed power available at the mine will not be part of the SVEC system, or available to the public (Hayes 1990).

4.2.8.10 Socioeconomic Mitigation Measures

The socioeconomic effects of the Proposed Action are limited to three primary categories:

- Fiscal deficits in Modoc County caused by the County not receiving property tax revenues from the Project;

TABLE 4.8-8

PROJECTED FISCAL IMPACTS ON CITY OF SUSANVILLE

	Revenues						
	Project-Direct Property Tax	Project-Direct Sales-Use Tax	Property Tax From Impact Housing	Other Revenue From Impact Population	Total Revenues	Costs From Impact Population	Benefit/ (Cost)
1992	$ 59,500	$ 37,000	$ 8,000	$ 54,000	$ 158,500	$ 62,000	$ 96,500
1993	53,550	26,000	8,000	54,000	141,550	62,000	79,550
1994	47,600	26,000	8,000	54,000	135,600	62,000	73,600
1995	41,650	26,000	8,000	54,000	129,650	62,000	67,650
1996	35,700	26,000	9,000	54,000	124,700	62,000	62,700
1997	29,750	26,000	9,000	54,000	118,750	62,000	56,750
1998	23,800	26,000	9,000	54,000	112,800	62,000	50,800
1999	17,850	26,000	9,000	54,000	106,850	62,000	44,850
Average	$38,675	$ 26,000	$ 9,000	$ 54,000	$ 128,675	$ 62,000	$ 66,675
Cumulative	$309,400	$219,000	$68,000	$432,000	$1,028,400	$496,000	$532,400

Source: Planning Information Corporation.

TABLE 4.8-9

PROJECTED FISCAL IMPACTS ON MODOC COUNTY GOVERNMENT

	Revenues						
	Project-Direct Property Tax	Project-Direct Sales-Use Tax	Property Tax From Impact Housing	Other Revenue From Impact Population	Total Revenues	Costs From Impact Population	Benefit/ (Cost)
1992	$0	$0	$ 9,000	$ 178,000	$ 187,000	$ 220,000	$ (33,000)
1993	0	0	9,000	178,000	187,000	220,000	(33,000)
1994	0	0	9,000	178,000	187,000	220,000	(33,000)
1995	0	0	9,000	178,000	187,000	220,000	(33,000)
1996	0	0	9,000	178,000	187,000	220,000	(33,000)
1997	0	0	9,000	178,000	187,000	220,000	(33,000)
1998	0	0	10,000	178,000	188,000	220,000	(32,000)
1999	0	0	10,000	178,000	188,000	220,000	(32,000)
Average	$0	$0	$ 9,000	$ 178,000	$ 187,000	$ 220,000	$ (33,000)
Cumulative	$0	$0	$74,000	$1,424,000	$1,498,000	$1,760,000	$(262,000)

Source: Planning Information Corporation.

TABLE 4.8-10

PROJECTED FISCAL IMPACTS ON CITY OF ALTURAS

	Revenues						
	Project-Direct Property Tax	Project-Direct Sales-Use Tax	Property Tax From Impact Housing	Other Revenue From Impact Population	Total Revenues	Costs From Impact Population	Benefit/ (Cost)
1992	$0	$0	$ 2,000	$ 20,000	$ 22,000	$ 22,000	$0
1993	0	0	2,000	20,000	22,000	22,000	0
1994	0	0	2,000	20,000	22,000	22,000	0
1995	0	0	2,000	20,000	22,000	22,000	0
1996	0	0	2,000	20,000	22,000	22,000	0
1997	0	0	2,000	20,000	22,000	22,000	0
1998	0	0	2,000	20,000	22,000	22,000	0
1999	0	0	2,000	20,000	22,000	22,000	0
Average	$0	$0	$ 2,000	$ 20,000	$ 22,000	$ 22,000	$0
Cumulative	$0	$0	$16,000	$160,000	$176,000	$176,000	$0

Source: Planning Information Corporation.

- The potential for induced housing in rural areas of the County (along the power line corridor and in Adin and Bieber) with associated increases in costs of serving these areas; and

- Fiscal operating deficits in school districts.

There are no mitigation measures proposed for the first category of impacts.

The second category could be mitigated by the adoption of the Power Supply Alternative.

The third category of impacts are due largely to the structure of California school financing mechanisms (i.e., increased State funds associated with new enrolment are not always sufficient to cover increased operating costs). Therefore, to mitigate school district operating deficits the following measure should be taken:

- LGMI and the local governing bodies should proceed with discussions regarding negotiated compensation by LGMI to mitigate this impact.

4.2.8.11 Unavoidable Adverse Impacts

The only unavoidable adverse impact identified from the Proposed Action is the potential for fiscal operating deficits in school districts. While demand for local government facilities and services will be strained, they are unavoidable. The significance of the impact to school operating deficits depends on the outcome of any negotiated compensation, as stipulated between LGMI and local governing bodies. Therefore, conservatively assuming that LGMI cannot provide complete compensation for fiscal operating deficits for school districts; this impact remains unavoidable. This is considered significant.

4.2.8.12 Cumulative Socioeconomic Impacts

Information used in the assessment of potential cumulative socioeconomic impacts was obtained from secondary data, interviews with employers in the major industries in Lassen, Modoc and Shasta Counties, and California Employment Development officials in those three counties.

Anticipated Economic and Employment Change

Several major basic industries in Lassen and Modoc Counties are anticipating potential employment change in the next several years. These are: The timber and wood products industries, the California Correctional Center near Susanville, and the Sierra Army Depot at Herlong.

Timber and Wood Products Industry - Management officials of timber industry and wood products companies in the Susanville area anticipate stable conditions over the next several years. Sierra Pacific Industries in Susanville anticipates maintaining the current level of 200 employees (Stanley 1991) and Susanville Forest Products also anticipates maintaining their current 100-worker level (Parker 1991). In the Big Valley area, conditions in the timber industry are less stable. The Clear Pine operations closed in 1989 and 1990, laying off 90 workers (Loucks 1991). Big Valley Lumber Company in Bieber anticipates maintaining an average level of 100 workers with a possible 5 percent increase over the next year (Main 1991).

Timber and wood products industries in Lassen, Modoc and Shasta Counties are not considered stable due to market demand. A mill in Alturas laid off 50 workers on August 1 of 1990 (Townsend 1990; Richardson 1991) and the logging industry in Shasta County appears to be gearing down as a result of recent Federal environmental actions and proposed State legislation (Camillieri 1990). A Shasta County timber products firm, Burney Forest Products, closed last year, laying off 90 workers (Loucks 1991). The population effects of the layoffs and industry slow-downs are not yet clear. However, it appears that unemployed timber industry workers will eventually leave the area if no new jobs are available to replace those lost.

California Correctional Center Expansion - Clearly the most significant activity in terms of cumulative socioeconomic effects in the area of influence is the proposed expansion of the California Correctional Center at Susanville. When completed, the proposed expansion would generate the following socioeconomic effects under a "190 percent occupancy" assumption: An estimated 965 new direct jobs, an estimated 542 induced jobs, a total population increase of 2,162 people, an increase in school enrollment of 662 students, and demand for 676 new housing units (Parks 1990). The population, housing and school enrollment estimates are based on a local hire ratio of 30 percent for operations employees and 90 percent for induced jobs. These local hire rates are considered to be optimistic by some local officials. Although the Department of Corrections anticipates a maximum of 500 construction workers on site at any one time, potential socioeconomic impacts associated with construction of the proposed corrections facility are not yet defined (Parks 1990).

The socioeconomic analysis to support the EIR for the Correctional Center was not complete at the time of this report. However, the Lassen County Planning Department compiled a list of certain and potential significant impacts associated with the expansion project (Williams, et al 1990). These include:

- Increased demand for both high- and low-density residential development in Susanville and other communities in southern Lassen County; and

- Increased demands on public services in these communities including law enforcement, fire protection, schools, recreation facilities, recreation programs, and maintenance of public facilities.

The California Correctional Center expansion would result in the need for new elementary and high schools in Susanville. Also, the Correctional Center expansion very likely would result in strained operating budgets for the Susanville elementary and high school districts because State revenues that accompany new students do not cover all associated staff and increased operating costs.

The population increase associated with the Correctional Center expansion would result in increased demand for public facilities and services provided by Lassen County and the City of Susanville. This increased demand would require additional staff and increased operating costs.

Unlike the Hayden Hill Project, the Correctional Center expansion would not generate an increase in assessed valuation for the County, and the increases in residential assessed valuation associated with Correctional Center employees would not offset the increases in operating costs. As a result, there is a possibility that substantial fiscal deficits related to the Correctional Center expansion would occur for Lassen County government under the cumulative case. The City of Susanville would receive sales tax revenues from purchases related to the Correctional Center expansion. At present it is not known if these revenues would be sufficient to offset increased operating costs related to the Correctional Center expansion.

Sierra Army Depot - The Sierra Army Depot at Herlong temporarily lost some temporary employee positions in October, 1990. But with the initiation of Operation Desert Shield and Desert Storm in the fall and winter of 1990-1991, the depot added 60 to 70 temporary employees who are still involved in restocking operations. The depot will obtain a new supply and storage project over the next year which will require the addition of 50 to 60 permanent employees (Rodgers 1991).

Assuming a net staff increase of 50 to 60 employee positions over the next several years, induced population growth due to Sierra Army Depot projects would range from 100 to 3000 persons, depending on the amount of the workforce drawn from the local labor pool. An estimate of from 70 to 190 additional persons residing in Lassen County is a wide-ranging population impact estimate which reflects the possibility that the schedules for the California Correctional Center expansion, the Hayden Hill Project and the new projects at the depot would coincide, which would result in competition for local workers. Competition would limit the number of local hires that the depot (and other projects) would be able to obtain. Second, because of the location of the Sierra Army Depot, new workers might choose to live in communities in Plumas and Sierra Counties in California and Washoe County in Nevada.

Commuting to these areas would be particularly likely if the schedule for expansion at the California Correctional Center coincides with the depot's new projects.

Potential Cumulative Socioeconomic Impacts

When considered in isolation, the socioeconomic effects of the Proposed Action are limited to: 1) Project-related fiscal deficits in Modoc County, a location which would not receive property tax from the Proposed Action; 2) the potential for induced housing in rural areas of Lassen and Modoc Counties (along the power line corridor and in Adin and Bieber) with associated increases in costs of providing these areas with local government services; and 3) Project-related fiscal operating deficits in several school districts resulting from the structure of California school financing mechanisms.

The cumulative case has the potential to significantly alter the socioeconomic effect of the Proposed Action. This potential stems primarily from the substantial socioeconomic impacts to Susanville and southern Lassen County that would accompany the proposed California Correctional Center expansion. Any layoffs in the timber industry in Lassen, Modoc and Shasta Counties would have little effect on cumulative socioeconomic conditions, except to increase the pool from which locally hired workers would be drawn. The possible expansion at the Sierra Army Depot would add to potential cumulative effects, but workers would be more likely to locate in communities south of Susanville if the Correctional Center expansion occurs. The Applicant has established late 1991 or early 1992 as a target for commencement of the operation phase of the Hayden Hill Project. Construction of the Correctional Center expansion is currently scheduled to begin in February of 1992, with occupation of the Correctional Center beginning in the fall of 1993. If these schedules hold, the socioeconomic effects of the Hayden Hill Project would coincide with the effects of Correctional Center construction. The socioeconomic effects of the Correctional Center expansion would occur primarily in the Susanville area and southern Lassen County. Competition for workforce would result in the potential for reduction in the number of workers that LGMI might be able to draw from southern Lassen County. To the extent the existing labor pool in the Big Valley area and in Modoc and northeastern Shasta Counties could not compensate for this reduction, the number of immigrating Project workers and families would increase. The additional population associated with immigrating workers and their families would increase demands on schools and local government facilities and services, compounding the socioeconomic effects described for the Proposed Action and the California Correctional Center.

Hayden Hill operations workers and prison expansion construction workers would compete for housing in the Susanville area which would likely result in increased numbers of LGMI immigrating workers seeking housing in the Big Valley and Alturas areas. Rising housing costs in Susanville in anticipation of the Correctional Center expansion could result in similar effects. This increased population in the Big Valley area and Modoc County would produce a corresponding increase in demand for schools and local government facilities and services in those areas. Depending on the number of LGMI workers that would choose to locate in the Big Valley area or in Alturas under this cumulative case, the potential for exceeding the available capacity of local government services and school facilities is substantially increased. The available capacity in the Big Valley District primary school and the Modoc High School could be exceeded. The capacity of the Bieber, Adin and Alturas sewer systems could also be exceeded. If housing competition in Susanville under the cumulative case resulted in substantial additional population in Modoc County, the Project-related fiscal deficits discussed in Sections 4.2.8.6 and 4.2.8.8 would increase accordingly. The potential for excess housing stock in rural areas of the County after Project closure would also increase under the cumulative case.

4.2.8.13 Impacts Associated with Scheduled and Premature Project Closure

Potential effects of closure of the Hayden Hill Project would involve local employment and economic conditions, population conditions, housing, education, local government facilities, services and fiscal conditions.

In large part, the effects of either scheduled or premature Project closure would depend on economic conditions in the area surrounding the Hayden Hill Project at the time of shutdown. If an expanding economy exists, workers from the Hayden Hill Project could find other employment opportunities and the effects of closure would be minimal. However in an era of economic decline in one or more basic industries (such as timber and wood products), the effects of Project closure would be significant. In the case of scheduled closure, an opportunity exists for LGMI, area local governments and State and local economic development agencies to develop programs to avoid and/or mitigate the negative effects of Project closure.

Closure of the Hayden Hill Project would result in the loss of 210 Project jobs, although a number of employees would remain on the payroll until reclamation activities could be completed. The loss of local purchases associated both with the Project and Project employees would result in a loss of an estimated 84 induced jobs in communities surrounding the Project area. Project employees who choose to stay in the area after closure would still require goods and services even though their income might be substantially lower than when they were employed at the Hayden Hill Project. Therefore induced employment losses would occur over a period of time.

Population loss associated with closure of the Hayden Hill Project is more difficult to estimate. The experience with the timber and wood products industry has been that many employees have elected to remain in the area after the mills have closed. Although this phenomenon could be attributed to the potential for employment opportunities both at the Hayden Hill Project and at the proposed new California Correction Center near Susanville, employment officials also attribute it to the fact that many people have moved to northern California for the quality of life and are willing to stay in the area even if it requires accepting lower paying employment (Dryer, Richardson, Loucks, 1991).

An incremental population of 365 persons is projected to be associated with the Hayden Hill Project. This estimate represents workers and their families who would in-migrate (move into) the area to accept employment, either at the Project or with retail and service companies in Susanville. (Induced jobs in other communities are assumed to be filled by local hires.) These newcomers will include those with managerial and technical skills who may be most likely to relocate upon Project closure. In general, newcomers are less likely to have social ties to the community and therefore may be more likely to leave upon Project closure. Local hires may have greater ties to the area and therefore may be more likely to stay and seek other employment after Project closure. It is reasonable to assume the longer the Hayden Hill Project lasts, the more likely Project employees and their families are to develop social ties in the area, the more likely they are to invest in homes and the more likely their spouses will obtain other employment in the community. All of these factors would result in Project employees attempting to stay in the area after Project closure.

It is also reasonable to assume that Project employees would have more opportunity to plan for other employment after a scheduled closure, so it is likely that less relocation would occur after scheduled as opposed to premature closure.

Demand for an estimated 121 housing units would be generated by the Hayden Hill Project. An estimated 57 of these would occur in Susanville, 18 in Alturas, 26 in Adin and 20 in Bieber. Because housing availability in these communities is very tight, it is assumed that some portion of the demand would be filled by mobile homes. The effects of Project closure on area housing conditions would depend, in part, on the numbers of Project and induced employees who would relocate to seek other employment. However, relatively few houses that would be constructed to meet Project-related demand and these houses would be distributed in four communities. Mobile homes moved into the area to meet Project-related demand would be relatively easy to relocate and the few homes constructed to respond to Project-related demand would help to serve the tight housing market. This would be particularly true of homes in the Susanville area if the proposed California Correction Center is constructed.

As a result of the California system of financing public schools, Project closure would have little effect on the operating costs of any school district. Those schools that were required to hire additional teaching staff might have to cut back on one or two positions, either through attrition or lay-offs. No schools were projected to need new facilities to accommodate demand associated with the Project, although several schools might be required to add additional classrooms. To the extent that these classrooms were no longer needed as a result of Project closure, the local districts would be required to expend funds to maintain these unneeded facilities and would not receive property tax revenues to support any remaining costs allocated to lease or purchase the additional classroom space.

No local government is expected to be required to construct new or to expand existing capital facilities to accommodate the demand associated with the Hayden Hill Project. Therefore the impact of Project closure on public facilities would be minimal. The population loss associated with Project closure would result in a corresponding reduction in demand for local government services and therefore a reduction in operating costs. To the extent that any local government may have hired additional staff to accommodate Project-related demand, staff layoffs could occur. However, because the in-migrant population associated with the Project is anticipated to be relatively small and distributed in four communities in two counties, it is likely that few lay-offs would occur. One exception could be in the area of unemployment services and human services. If a substantial number of Project employees remain in the area after closure and are not able to find jobs, increases in demand for unemployment services, other public assistance programs and human services could occur.

Closure of the Hayden Hill Project would result in a loss of an estimated annual $500,000 (in 1990 dollars) to Lassen County taxing entities (see Table 4.8.2). In addition Lassen County would lose an estimated annual $194,000 and Susanville would lose an additional $26,000 in sales and use taxes generated by Project-related expenditures (see Tables 4.8.3 & 4). To the extent that Project-related and Project-induced employees were to relocate out of the area, the property tax, sales tax and other local government revenues associated with that population would be lost. Workers who remain in the area and accept lower paying employment or require public assistance would have a negative effect on sales tax and other local government revenues.

The analysis provided above is speculative in a number of areas. These areas include the uncertainty of what the economic and employment atmosphere will be like 8 years from now, when the Project would close, and the inability to predict gold prices and technology changes which may halt the Project or extend it. The NEPA and CEQA guidelines do not require that speculative impacts be considered in depth. For this reason no further analysis is provided on this subject. Any possible impacts from the closure of the Project could be avoided if the local taxing entities remain abreast of any changes in the Project status and respond accordingly.

4.2.9 Land Use

4.2.9.1 Issues, Concerns and Opportunities

Issues and concerns related to land use are listed below:

1. **Are the existing land use designations compatible with the Proposed Action?**

2. **What will be the impacts to livestock grazing and lease agreements?**

3. **What will be the impacts to future land uses?**

The compatibility of existing land use designations, Issue 1, are discussed in Section 4.2.9.3. Issue 2, grazing impacts are addressed in Section 4.2.9.4, under the Range subheading.

Issue 3, the future land use impacts, are addressed Sections 4.2.9.6 and 4.2.9.7. The Reclamation Plan in Appendix E outlines the goals and objectives of post-closure and post-reclamation land use.

4.2.9.2 Land Use Impacts

The potential impacts of mining-related activities on the area's land uses are based upon the compatibility of the Proposed Action with the existing land uses and the consistency of the proposed activities with existing management plans, policies, and regulations. The impact analysis on land use applies the following criteria to determine if an impact will be significant:

- **Proposed activities would not conform with approved land management or resource management plans, existing planning objectives, zoning ordinances or other regulations on the proposed location; or**

- **Proposed activities would result in the exclusion of existing or permitted land uses on adjacent or nearby properties, either directly or indirectly.**

Table 4.9-1 lists the Project impact areas by land ownership.

4.2.9.3 Consistency with Plans, Policies, Ordinances, and Regulations

Modoc National Forest (MNF)
Mining activities are consistent with the Forest Service's multiple use planning objectives provided in the Draft Modoc National Forest Land Management Plan (LMP). The MNF has not developed specific management prescriptions for mining operations, but acknowledges the potential mining resources at Hayden Hill in its Draft LMP (USFS 1987b). Currently, activities on MNF lands are managed to preserve the development of the mineral resources at Hayden Hill. The application of best management practices are required in the development of the Project to achieve resource utilization and maintain multiple land use objectives.

TABLE 4.9-1

IMPACT AREAS BY LAND OWNERSHIP TYPE

U.S. Forest Service Administered

T36N, R 9E, Sections 3 & 4	1.25 miles ROW along Bunselmeier well field corridor
T37N, R 9E, Section 24	0.75 mile ROW along Preston Canyon well field corridor
T37N, R 9E, Section 25	0.3 miles ROW along Preston Canyon well field corridor
T37N, R 9E, Section 35	1.0 mile of ROW along north side of Bunselmeier well field corridor
T37N, R 10E, Section 20	0.25 miles ROW along transmission line corridor
T37N, R 10E, Section 29	0.75 miles ROW along Hayden Hill Road beginning at Highway 139
T37N, R 10E, Section 30	0.25 miles ROW along Hayden Hill Road
T37N, R 10E, Section 32	0.1 miles ROW along Hayden Hill Road

Bureau of Land Management Administered

T36N, R 9E, Section 1	130 acres within the mine site block
T36N, R 10E, Section 6	0.10 mile of ROW along the Hayden Hill Road
T36N, R 10E, Section 31	141 acres within the mine site block
T36N, R 9E, Section 36	200 acres within the mine site block
T36N, R 9E, Sections 15 & 22	1.25 miles of ROW along the transmission line corridor
T36N, R 9E, Section 39	0.25 miles of ROW for the transmission line corridor

Private Lands

T36N, R 9E, Section 1	340 acres within the mine site block
T36N, R 9E, Section 2	1.0 mile of ROW along south side of Bunselmeier well field corridor
T37N, R 9E, Section 1, 2 & 12	1.75 miles of ROW for the transmission line corridor
T37N, R 9E, Section 13, 24 & 25	1.75 miles along the Preston Canyon well field corridor
T36N, R 9E, Section 5	0.20 miles of ROW along the Hayden Hill Road
T36N, R 9E, Section 6	1.0 mile of ROW along the Hayden Hill Road
T37N, R 9E, Section 18, 19 & 20	2.25 miles of ROW for the transmission line corridor
T37N, R 9E, Section 31	185 acres within the mine site block
T37N, R 9E, Section 31	0.5 miles of ROW along the Hayden Hill Road
T37N, R 9E, Section 32	0.5 miles of ROW along the Hayden Hill Road
T37N, R 9E, Section 36	328 acres within the mine site block
T38N, R 9E, Sections 4, 9, 10, 22, 27 & 35	5.25 miles of ROW for the transmission line corridor

The proposed Project boundary is not included in or designated for study as part of the National Wild and Scenic Rivers System, the National Trails System, wilderness area as designated under the Wilderness Act, or any other Federal program.

The Project will require the following:

- An approved Final Plan of Operations (POO);
- Special Use permit (LGMI and USFS) for road construction, reconstruction and maintenance on the ROW for well water and power line corridors across MNF properties;
- A Federal Land Policy and Management Act (FLPMA) easement between the County and the MNF for Hayden Hill Road where the existing road crosses MNF administered land.

Bureau of Land Management (BLM)

Mining operations are consistent with BLM's multiple land use policy for the Mountain Management Area as described in the Alturas Resource Area Management Plan (RMP). The RMP further identifies the area as having the highest potential for mineral exploration. The Hayden Hill area is recognized in the RMP as a potential resource opportunity (BLM 1983).

Mining operations must comply with the requirements of 43 CFR 3809 regulations, including:

- Submit a POO;
- Comply with Federal and State air quality standards, including the Clean Air Act;
- Comply with Federal and State water quality standards;
- Comply with applicable standards for the disposal and treatment of solid wastes, including the Solid Waste Disposal Act, as amended by the Resources Conservation and Recovery Act;
- Take necessary actions to avoid adverse impacts to threatened or endangered species and their habitats;
- Comply with Section 106 of the National Historic Preservation Act; and
- Comply with Section 404 of the Clean Water Act.

Lassen County

The Proposed Action is expected to be consistent with the Lassen County Hayden Hill Area Resource Plan. The Proposed Action would develop mineral resources in an area recognized as having potential for gold development.

State regulations under the SMARA require mining operations be conducted in such a manner to minimize adverse environmental impacts, and mined lands and disturbed areas be "reclaimed to a usable condition which is readily adaptable to alternative land uses".

The Proposed Action is required to be consistent with the Resource Plan objectives, SMARA, and CEQA. The following will be required:

- Approved Surface Mining Permit;
- Approved Reclamation Plan;
- Approved Hayden Hill Resource Plan;
- Approved County Conditional Use Permit; and
- Adoption of the Mitigation Compliance Program.

California Department of Transportation

A new 69KV transmission line will be required to provide power to the proposed Project. Building of the existing line and new line construction will not alter the existing land uses within the proposed 20-foot ROW needed by the Project. However, an easement from the California Department of Transportation (Caltrans) will be required prior to construction.

4.2.9.4 Compatibility with Existing Land Uses

Range

One of the primary existing land uses within the "land use mine site block" is for grazing (Figure 3.9-1). The Proposed Action will preclude the use of the lands within the mine site block from grazing during the life of the Project. These lands currently provide approximately 67 animal use months (AUM's). The Project will utilize 512 acres of BLM land with a total carrying capacity of 57 AUM's. Depending on the selected alternative, the Project could utilize 197 acres of USFS land with a carrying capacity of 10 AUM's. Lands adjacent to the mine site will continue to be used for grazing. There are no proposed changes to grazing permits on USFS land. The BLM will notify permittees of any suspended AUMs.

Agricultural Preserve
Approximately 658 acres of private land within the Project site boundary is classified as agricultural preserve. This is part of an existing 1,932 acre agricultural preserve. The Proposed Action may require cancellation of a portion of the Williamson Act Contract, if the State determines that mining uses are not compatible with uses of agricultural preserve lands. The property owners have submitted a petition for cancellation of the Williamson Act Contract. The County is entertaining the petition at this time.

Timber
USFS and BLM - Commercial forest lands are defined by forest management agencies as lands capable of producing greater than 20 cubic feet of timber per acre per year. Commercial forest lands occur on approximately 17 acres of USFS land along the access road and on approximately 88 acres of BLM land in Section 36, T37N, R9E. If the Proposed Action is taken, approximately 105 acres of timber producing land would be removed from production. Preliminary estimates of the standing timber volume on MNF land within the mine site boundary is 1000 to 5000 board-feet per acre. The MNF and BLM would either sell the timber to the Applicant or to another interested party for removal. This impact is not considered significant.

Recreation
The Proposed Action would result in limited Public access into the mine site. This will preclude access to 530 acres of the State game refuge. The 530 acres represents 1.2% of this State game refuge area. The State game refuge system was started to prohibit hunting of sage grouse and pronghorn to increase their number. It is now believed that habitat controls population. Hunting will not be allowed on the refuge inside the Project boundary. The area will still be a State game refuge during and post-mining. The impacts to land use and recreation are not considered significant, since the original intent of the refuge was to protect wildlife by prohibiting hunting, this intent will still be carried out.

4.2.9.5 Other Land Use Impacts

The proposed transmission line will be constructed across Highway 299 and along Highway 139 within the County Scenic Highway corridor and the Caltrans ROW. The installation of the single wood pole structures are not expected to result in any impacts to the existing uses of the ROW. The ROW is used primarily for grazing and utility access. The adoption of the power supply alternative would render this impact insignificant.

4.2.9.6 Mitigation Measures for Land Use Impacts

- The Applicant and permittee are working out an equitable solution to mitigate for any suspended AUMs. The BLM will be notified of these arrangements.

- The County is entertaining canceling the Williamson Act Contract, at the owners request, as it pertains to 658 acres which would be disturbed by mining activities.
- The Applicant should work with Federal agencies to identify, inventory, and schedule the removal of timber and vegetative resources prior to implementing the Project.
- The Applicant should adopt the Power Supply Alternative to minimize growth inducing impacts.

4.2.9.7 Unavoidable Adverse Impacts for Land Use

The Project will require the commitment of approximately 950 acres to mining and related facilities for approximately 8 years. Grazing is the primary land use in the area and operation of the Project will exclude livestock from the area. The Project will also commit 658 acres of designated agricultural preserve to mining. The conversion of land use from rangeland to the mining of significant gold and silver resources is not likely to result in the removal of adjacent lands from agricultural use, or result in discontiguous patterns of urban development, since the cause for conversion (i.e. the mineral resource) is unique to the site. This impact is not considered significant.

Approximately 105 acres of Federal commercial forest land will be eliminated by mining operations. Following mine reclamation, these Federal lands are not expected to support commercial timber. The acreages of commercial timber affected are small compared to those available in the region, therefore, this impact is not considered significant.

While phased reclamation efforts will occur throughout the life of the Project to meet the post-Project land use objectives identified by the BLM, USFS, and County, the Project lands will be committed to mining-related use until reclamation is complete.

4.2.9.8 Cumulative Impacts

Approximately 105 acres of timber land will be lost as timber producing land due to vegetation and soil removal and burial under the waste rock dump. It is unlikely this land will be able to be returned to the pre-mining timber producing quality it once had. Other timber sale areas in the vicinity of the Project are being considered for harvest. However, there are no other projects or activities in the area now or proposed in the near future which would remove additional timber lands from future production. The impact of this lost timber producing land is, therefore, considered a direct impact of the Project and not a cumulative impact. No other cumulative impacts were identified under land use.

4.2.10 Cultural Resources

4.2.10.1 Issues, Concerns and Opportunities (ICOs)

Following are the ICOs pertaining to cultural resources at Hayden Hill:

1. How will historical and archaeological sites in the Project area be affected and/or protected?

2. What will be done regarding the presence of graves which lie outside of the cemetery?

In regard to issue 1, Section 3.10 in Chapter 3 describes the cultural survey and sites identified in the Project area. The following sections discuss eligibility requirements for the National Register of Historic Places (NRHP), identify the eligible sites that would be impacted by the Proposed Action, and discuss impacts and mitigation measures for the eligible sites.

In regard to issue 2, a good faith effort was made by the BLM to locate graves outside of the cemetery. No graves were found by the BLM, or by Western Cultural Resource Management (WCRM) during the cultural survey. Mitigation measures for graves encountered during the Proposed Action are discussed in Section 4.2.10.5.

4.2.10.2 Eligibility

The Hayden Hill Project qualifies as a Federal undertaking which may have adverse effects upon cultural resources located within the Project area. Evaluation of all potential impacts to cultural resources within the Area of Potential Effect (APE) is required for all alternatives. This is pursuant to Section 106 of the National Historic Preservation Act, as amended and it's implementing regulations (36 CFR Part 800), Section 101 (b)(4) of the NEPA, the Joint Resolution on American Indian Religious Freedom Act, and other rules and regulations.

The following steps have been undertaken for the Hayden Hill Project with respect to both the Section 106 and the Archaeological Resources Protection Act (ARPA) review process:

1. All areas of proposed impact received a Class III cultural resource inventory for every alternative considered in this EIR/EIS. Cultural resources located within these areas were evaluated under the criteria set forth in 36 CFR 60.4 for eligibility to the NRHP. The Determination of Eligibility was made by the BLM, Susanville District Office in consultation with the California State Historic Preservation Office (SHPO).

The Pit River Nation and the Susanville Rancheria were both notified by registered mail to see if they had any concerns about the project (Appendix H). The Pit River Nation also attended a scoping meeting about the Project. Both Native American groups have received copies of the Draft and Final EIR/EIS. Thus far, there have been no comments from the Native Americans.

2. The BLM applied the Criteria of Effect which the Project may have on the identified cultural resources which have been determined Eligible to the NRHP. The BLM sought SHPO concurrence on this effect and submitted recommended mitigation actions to the SHPO and the Advisory Council on Historic Preservation (ACHP) for comment. The ACHP comment only applies to those sites which are determined Eligible to the NRHP and which will be affected by the Proposed Action or alternatives.

3. The ACHP commented upon the effects of the action on the eligible sites and the measures proposed to mitigate the adverse effects. The BLM has the option to agree or disagree with the ACHP comment and must notify the ACHP of their decision regarding the effect of the action. See Appendix H for the Section 106 consultation process correspondence.

National Register criteria, as set forth in 36 CFR Part 60.4, to evaluate a cultural resource site for inclusion on the NRHP, were applied to all sites within the Project area. The National Register criteria are:

The quality of significance in American history, architecture, archaeology and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association: and

A. That are associated with events that have made a significant contribution to the broad patterns of our history;

B. That are associated with the lives of persons significant in our past;

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that represent artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or,

D. That have yielded, or may be likely to yield, information important in prehistory or history.

Following is a summary of the eligible and non-eligible sites found in the Hayden Hill Project area:

Mine Block Inventory
In *A Class III Cultural Inventory of the Hayden Hill Project*, Lennon et al. (1990) concurred with the earlier BLM, Susanville District, and USFS NRHP recommendations for the Hayden Hill Fire Tower and Hayden Hill Townsite.

Four prehistoric sites/site components are located within the proposed impact area. Following limited testing for subsurface components and the application of the California Archaeological Resource Identification and Data Acquisition Program (CARIDAP), Sparse Lithic Scatter program, the sites were determined Not Eligible by the BLM in consultation with SHPO.

The Hayden Hill fire tower is recommended as Eligible to the NRHP under criteria A and C as part of a regional thematic study of USFS fire towers in California (criterion A) and as a significant example of early 20th century USFS architecture (criterion C). The Hayden Hill fire tower was earlier determined Eligible to the NRHP by the California SHPO in January of 1990.

Thirteen of the historic resources within the townsite boundary are recommended as Eligible to the NRHP under criteria C and D, with the Hayden Hill Townsite recommended Eligible as a NRHP district under criteria A, C, and D. Four additional historic sites not within the townsite boundary are recommended as NRHP Eligible under criteria C and/or D. A discussion of the application of these criteria to the contributing elements of the Hayden Hill Townsite is found in Lennon et al. (1990).

All other historic sites are recommended Not Eligible to the NRHP, due to their previous disturbance or lack of contributing elements. The Hayden Hill Cemetery has no exceptional significance that would warrant a National Register nomination and it is not a significant example of landscape architecture as identified in the United States Department of the Interior (USDI), National Park Service (NPS), National Register *Bulletin 16* (USNPS 1986).

Access/Corridor Routes Inventory
Eligibility of the two prehistoric sites identified by Caltrans has not been determined as of this writing.

The portion of a previously recorded arrastra flume which is found within the inventory right of way is recommended as a non-contributing element of the entire flume site due to its extremely low physical integrity. All other remaining historic sites/components are recommended as Not Eligible to the NRHP due to their previous disturbance and/or lack of contributing elements. All of the remaining 11 prehistoric sites/components are recommended as Not Eligible to the NRHP due to their limited potential to provide information important to prehistory.

4.2.10.3 Previous Impacts

Prior disturbances (impacts) within the Project boundary can be attributed to historic mining (both vein-tracking underground and exploration activities, and heap leach methods), livestock grazing activities, minor development of natural springs, minor logging activities, and road improvement. The estimated total area of historic disturbance within the entire Project prior to present day Project activities is approximately 200 acres. Much of the previous disturbance lies within the proposed Project's primary development area. To date more than 600 holes have been drilled and access roads developed in order to evaluate and define the ore body, facilities, site areas, search for groundwater, and conduct geophysical tests (HHOC 1989a).

4.2.10.4 Potential Impacts

The Hayden Hill Project will affect cultural resources found within the Project primary development area. The Proposed Action has the potential to impact sites both directly and indirectly. Table 4.10-1 is a summary of the cultural resource sites that are NRHP eligible and subject to impact by the Proposed Action.

__Direct Impacts__

__Hayden Hill Townsite__ - The destruction of the Hayden Hill Townsite by Project construction, as it is located within the primary development area, is considered an adverse impact.

__Hayden Hill Fire Tower__ - Project construction would necessitate the destruction of the fire tower, as it is located within the primary development area. This is considered an adverse impact. __Other Prehistoric and Historic Sites__ - Within the mine block inventory area Project construction would impact two other eligible historic sites (two domestic trash dumps), as they are located within the primary development area. Also four non-eligible prehistoric lithic scatters and four non-eligible historic sites would be impacted.

__Grave Sites and Buried Cultural Sites__ - Graves may be encountered outside of the cemetery during construction or operations. Buried cultural sites may be encountered during construction or operations.

__Indirect Impacts__

__Prehistoric and Historic Resources__ - Unauthorized collection of artifacts may occur during and after mine construction and during operation of the mine.

__Cemetery__ - Unauthorized removal or vandalism and degradation of the grave markers may occur due to increase in human activity during and after the construction and operation of the mine.

TABLE 4.10-1

CULTURAL SITES WHICH ARE NRHP ELIGIBLE AND SUBJECT TO IMPACT

Site Number	Site Name	Location: Mine Block/Corridor	Impacted By	Mitigation Status
4Las431	Hayden Hill Townsite	Mine Block	Mining related activities: proposed pit, processing facilities, waste rock dump and topsoil stockpiles	Data Recovery Plan completed and approved by SHPO and ACHP
4Las1429	Hayden Hill Fire Tower	Mine Block	Mining related activities: proposed pit	Data Recovery Plan completed and approved by SHPO and ACHP

4.2.10.5 Mitigation of Direct Impacts on Cultural Resources

To comply with the National Historic Preservation Act of 1966 (as amended) (16 USC 470-470 W-6) ACHP must be provided the opportunity to comment on effects to National Register eligible sites. This consultation process is set forth in 36 CFR 800.

A detailed mitigation plan (data recovery plan) was submitted to SHPO. The SHPO concurred with the plan and the ACHP was given an opportunity to comment. The ACHP also concurred with the plan, therefore the data recovery can be implemented.

Hayden Hill Townsite

The full effect of the impact would be adequately mitigated through the above data recovery plan prior to its further disturbance.

Hayden Hill Fire Tower

It has been recommended that relocation of the fire tower for use as a fire lookout will constitute an adverse effect on the building. Adequate mitigation is not possible as defined in NHPA Section 106. However, the intent of the law will be met by recording and relocating the structure according to the Historic American Buildings Survey (HABS). The relocation site for the fire tower is discussed in more detail in Section 4.3.6, Fire Tower Alternative.

Other Prehistoric And Historic Sites

Eligibility of the two prehistoric sites identified by Caltrans has not been determined. These sites are located along Highway 139 in the power line corridor. Mitigation measures for these sites follow:

- Impacts to these sites will be avoided, if possible, by power line construction. If impacts to these sites are unavoidable, eligibility to the NRHP will be resolved. In the event that an impacted site is determined to be eligible, mitigation measures will be determined at a later date in concurrence with the BLM and SHPO.

In the event that realignment of the Project will endanger any historic or prehistoric sites:

- The sites will be evaluated and the proper documentation submitted to SHPO.

Grave Sites and Buried Cultural Sites

In the event that a grave or buried cultural site is found during construction or operations:

- If a grave site is encountered all activity affecting the grave will cease until the grave site is evaluated by BLM and Lassen County officials.

- If an unknown cultural resource is encountered, all activity affecting the find will cease, and the Section 106 process will be initiated.

Access/Corridor Inventory
The 11 prehistoric sites/components and 15 historic sites/components have been documented. None of these sites will be directly impacted by the Proposed Action.

4.2.10.6 Mitigation of Indirect Impacts on Cultural Resources

Prehistoric and Historic Resources
The Applicant recognizes the serious consequences of disturbance and unauthorized collection of cultural resources. To deter these activities:

- In compliance with the ARPA of 1979, as amended (16 USC 470), the following information will be distributed to all employees, consultants and contractors and authorized visitors of the Hayden Hill Project:

> *Hayden Hill exploration and mining activities in the Project area are being conducted within an area of prehistoric and historic significance. Undue and unauthorized impacts to the resources, including theft, disturbance, or destruction of historic and prehistoric articles found on or around the site, carries a significant penalty: Up to $100,000 fine, up to a 5-year jail sentence, cost of restoration, value of resource, and forfeiture of vehicle or equipment.*
>
> *Protect your Country's resources, report violation to the land management agency where the violation took place. On public land, contact either the USFS or the BLM. Your information may be valuable. Rewards can be up to $500.*

Cemetery
The Hayden Hill Cemetery would be avoided in the present plan of operation. It is presently fenced and would remain fenced during the life of the mine.

4.2.10.7 Unavoidable Adverse Impacts

The Hayden Hill Project would have a direct effect on significant cultural resources within the primary development area. The Proposed Action would result in the alteration or destruction of prehistoric sites, historic archaeological sites and historic architectural sites. The Proposed Action would result in adverse physical or aesthetic effects to historic buildings, structures, or objects.

Mitigation measures incorporated into the Project design of avoidance, documentation, and data recovery will adequately mitigate the effects of adverse impacts to cultural resources resulting from the Proposed Action. Unavoidable adverse impacts to cultural resources are not considered significant.

4.2.10.8 Cumulative Impacts

No significant cumulative impacts have been identified for cultural resources.

4.2.11 Visual Resources

4.2.11.1 Issues, Concerns and Opportunities

Issues and concerns related to visual resources are listed below:

1. What are the visual resource values in the Project influence area?
2. How will the visual resource values be affected?

In regard to issue 1, Section 3.11.2 contains a description of the landscape around the Project site and along the Highway 139 power transmission line corridor. The USFS Visual Quality Objective (VQO) designations for these areas are described in Section 3.11.3.

Issue 2 concerns the impacts to visual resource values. The long-term, adverse visual effects will generally be seen from areas minimally used and of low sensitivity. This is explained in more detail in this section.

4.2.11.2 Impacts Associated With The Proposed Action

Hayden Hill Project

The Project components that are relevant to visual resources are; the pit, waste rock dump, tailings impoundment, processing facilities, heap leach facilities, access roads, and power lines. Each of these elements were evaluated in terms of their potential visual impacts. The visual impact of any facility, structure, or disturbance (such as construction needed for underground pipelines) is a function of whether or not it can be seen and how much of a contrast it presents compared to the surrounding area. The visibility of an activity must be related to a particular viewpoint or series of viewpoints.

During the life of the mine, the open pit, road cuts, and waste rock disposal site would contrast in form and color with the surrounding natural landscape, resulting in short-term and long-term adverse impacts. The reclaimed benches on the waste rock dump will contrast with the form and color of the unvegetated slopes in between, until natural revegetation of the slopes is complete. The reclaimed pit, even with reshaped highwalls, would not appear as a natural-looking landform and would remain apparent in the landscape, a long-term adverse impact. However, the pre-existing, disturbed condition of the mining site which consists of scars from roads, adits, and drill sites, currently presents a high adverse visual impact. This existing modification does not meet VQOs for this area.

The principal visual impact from Highway 139, the primary area of influence, would be middleground views of moderate duration of portions of the Project area. This impact would occur for an approximately 0.7 mile stretch of highway directly north of Hayden Hill (Figure 4.11-1). The view from this area would include the waste rock dump, the top of the pit, and activities such as growth media stripping which would be evident during the first phases of mining. Impacts from this view will be both short-term and long-term.

A photographic simulation has been prepared of the view of Hayden Hill from Highway 139. The location of the viewpoint, Viewpoint Number 1, is shown on Figure 4.11-1. Photograph A presents the view of the top of Hayden Hill from Highway 139 as it currently exists (Figure 4.11-2). Photograph B simulates the view of the top of Hayden Hill, displaying the top of the pit and waste rock dump, after the conclusion of post-mining reclamation and one growing season, approximately two years after the completion of mining (Figure 4.11-2). The photographs present the vegetation as it is in the fall when it is in a dormant state.

The improvements made for the access road to the mine at the intersection of Hayden Hill Road and Highway 139 would also be evident from the Highway. This would be a long-term impact. The Project will not be visible from the portion of Highway 139 adjacent to the Willow Creek campground due to the steepness of the topography and vegetative screening. None of the proposed facilities in the processing area would be visible from Highway 139.

The identified secondary area of influence is Lassen Volcanic National Park. This park is approximately 40 miles from Hayden Hill. Potential views of the Project from this area would occur as very distant background views and most likely would not affect the views from the Park.

The Hayden Hill Project will be visible from Hayden Hill Road and from the existing County and forest access roads surrounding the area. Views from the roads to the south and west would be impacted by the Project. Visual impacts from these roads would be both short-term and long-term. All elements of mining activity, including portions of the waste rock dump, would be seen from these areas. Due to the minimal use and low sensitivity of these routes, visual impacts are less of a concern than impacts from Highway 139.

A photographic simulation has also been prepared of the Project site from the south. The location of this viewpoint, Viewpoint Number 2, is shown on Figure 4.11-1. Photograph C presents Hayden Hill and the surrounding area as it currently exists (Figure 4.11-3). Photograph D is a simulation of this same area approximately two years after mining completion, after the conclusion of reclamation and one growing season (Figure 4.11-3). The reclaimed pit highwalls, tailings impoundment, and heap leach pad can be seen in Photograph D. The photographs present the vegetation as it is in the fall when it is in a dormant state.

Very minor visual impacts from Adin may occur in the initial stages of developing the pits and would consist of distant background views. The visual impact would be low. The background views from Little Gold Hill will also be impacted by the first phases of mining development and potentially by the waste rock dump. Impacts from these views would be short-term.

Hayden Hill Power Line

Visual impacts resulting from the installation of the power line will be short term. During construction, the power line right-of-way would be affected by heavy equipment which would be digging the holes for the power line poles. The vegetation should recover relatively quickly from the minimal disturbance and compaction. Only small portions of the right-of-way will be affected since poles will be spaced every 250-450 feet. According to SVEC, pole placement on steep slopes will be accomplished by hand tools rather than heavy equipment, thereby minimizing vegetative disturbance. If heavy equipment is used on steep slopes, it would be very damaging to existing vegetation and increase erosion. Routine maintenance of the line should have little impact on vegetation, except for the removal of trees which might affect the safety of the power line.

Vegetation along the power line right-of-way is generally sparse and in several sections (particularly Sections II and IV, Figure 3.11-2) there are long views along the right-of-way with little vegetation screening potential. Where there is existing vegetation, it is planned to place the line as close to the edge of the right-of-way as is practicable to minimize disturbance. In general, this means that the line can run within five feet of the limit of the Highway 139 right-of-way. In some instances, however, the line will be placed so that a number of trees will have to be cut, even when it would be possible to minimize tree cutting by placing it behind the trees. The SVEC plans to maintain a 4-foot diameter clearance zone around the outside conductor wires. In some cases, this practice will lead to the cutting of most of the branches of nearby pine trees.

The 55-foot height of the poles is considerably higher than many of the Juniper and pine trees, therefore these trees will not be capable of screening the entire height of the poles in some locations. However, the narrow profile design of the pole may make it less visible than traditional power lines with cross arms. The increase in height of the power line poles along the existing right-of-way in Adin from 40-to 45-feet to 55-feet will make the line more visually prominent in residential areas.

In those sections of the power line that have little vegetation in the right-of-way (primarily Section IV), the power line will be more visible. For the rest of the line the vegetative pattern is moderately diverse and can provide vegetation screening with the proper alignment.

Fire Tower Replacement at Snag Hill

A new fire lookout tower will be built on Snag Hill, nine miles west of Hayden Hill, to replace the existing Hayden Hill fire tower. The new lookout will be visible from many places in the area but is within the USFS VQO which is modification. Impacts to visual resources in this area are not considered significant.

4.2.11.3 Mitigation Measures for the Hayden Hill Project Area

The location of the Project facilities in conjunction with the Reclamation Plan described in Section 2.2.11 would result in a Project that will eventually meet the VQOs for the area. This will occur when reclamation has been completely established and when it is fully successful.

Visual Impacts from Highway 139 and the North

These views will be impacted by the waste rock dump and the top of the pit. The VQO designation is Partial Retention which allows modifications which are visually subordinate to the surrounding landscape. This area has a moderate Visual Absorption Capability (VAC) and, therefore, has a moderate ability to accept modification without visual degradation.

Short-term Impacts - Maintaining an edge of vegetation around the pit and waste rock dump would help to minimize visual impacts from Highway 139 during mining:

- Care will be taken during all phases of mining to minimize the elimination of vegetation (especially trees and shrubs) around the perimeter of the open pit, and wherever possible, adjacent to the waste rock disposal site.

Long-term Impacts - During reclamation, the edges of the benches of the waste rock dump will be rounded, which will soften the profile of the dump. However, in order for the waste rock dump to meet established VQOs, vegetation regeneration must be highly successful. Once vegetation has been fully established, the waste rock dump area would not be as apparent from Highway 139. It is planned in the Reclamation Plan for concurrent reclamation of the waste rock dump to take place. Topsoil previously stockpiled will be distributed on the dump top and benches prior to seeding and shrub and tree planting. Other measures to ensure revegetation success follow:

- Actual species to be planted on the waste rock dump will be determined by site-specific reclamation trials to identify hardy, native, drought tolerant species. (This mitigation measure is addressed in the revised Reclamation Plan, Appendix E.)

To promote topographic diversity and break up the horizontal lines of the benches, the following mitigation measures will take place:

- Subsoil will be left in a rough condition to break up the horizontal lines of the benches, but in a manner that is geotechnically stable.

- The rounding of the edges of the benches will be performed in a random manner to break the horizontal lines of the benches.

- The sloped area between benches will be hydroseeded with a seed mix determined for this purpose by site-specific reclamation trials. (This mitigation measure is addressed in the revised Reclamation Plan, Appendix E.)

Intersection of Highway 139 and Hayden Hill Road

Long-term Impacts - This intersection will be viewed from Highway 139. The landscape is rated for a VQO of Retention which allows for modifications that are not visually evident. Mitigation for this structure follows:

- The intersection of the access road and Highway 139 will be designed such that paving, plantings, and grading will repeat line, form, color, and texture found in the characteristic landscape.

Visual Impacts Roads South and West

Visual impacts from the County and forest access roads south and west of the Hayden Hill area are less of a concern than those from Highway 139. The VQO designation is Partial Retention. The VAC is rated moderate to low.

Short-term Impacts - During the life of the mine, the open pit, road cuts, and waste rock disposal site would contrast in form and color with the surrounding natural landscape. It is planned during reclamation to contour and round the crest of the heap leach facility and tailings impoundment. This will greatly assist in blending these areas into the surrounding topography. Vegetation regeneration, if successful, would reclaim those areas to the point where they will eventually become visually subordinate to their surroundings and meet the VQO for the site.

To lessen the short-term visual impacts of building and structures, the following mitigation will take place:

- Colors and materials, carefully selected to be harmonious with the natural surroundings, will be used on buildings and other structures.

Long-Term Impacts - The pit highwalls would not appear as a natural-looking landform. It is planned in the Reclamation Plan, to blast the unstable highwalls and preserve walls suitable for raptor nesting. To add more visual interest and more closely approximate natural rock outcroppings, the following mitigation will take place:

- To reduce the uniformity and unnatural appearance of the uppermost pit walls, the rock will be shaped and contoured to achieve a more natural appearance. This will be accomplished by a combination of blasting and shaping of the rock following completion of mining. Areas of talus slopes are desirable in reducing the horizontal lines of the benches and can be achieved by either blasting rock from above or piling rock up from the bottom. In either case, slope stability must be considered when reshaping the pit into the final contours. Ideally, areas will be blasted along natural fracture lines.

The reclaimed pit, even with reshaped highwalls, would not appear as a natural-looking landform and would remain apparent in the landscape. However, the pre-existing, disturbed condition of the mining site which consists of scars from roads, adits, and drill sites, currently presents a high adverse visual impact. This existing modification does not meet VQOs for this area.

Reclamation Monitoring

The Project will eventually meet the VQOs for the area if reclamation efforts are successful in establishing landforms, vegetation types and vegetation patterns that are harmonious with the surrounding natural landscape. Mitigation to ensure reclamation success follows:

- The monitoring program described in Section 4.2.4.3 will be used. (This mitigation measure is addressed in Section 4.9 of the revised Reclamation Plan, Appendix E.)

4.2.11.4 Mitigation Measures for the Hayden Hill Power Line

Vegetation screening potential varies along the right-of-way, however, the VAC is moderate to high along the entire corridor. Areas with a high VAC have a high ability to accept modification without visual degradation. The power line from Adin to the Hayden Hill Road should meet the VQOs for the proposed alignment if constructed so as to minimize visual impact. The following mitigation measures will accomplish this:

- The actual placement of the poles in the Highway 139 right-of-way will be accomplished with minimal vegetative clearing, and the power line will be woven into the landscape as much as possible. This entails strategic placement of the poles and lines and effective use of the entire Highway 139 right-of-way to minimize tree cutting. The line will be located as far away from the roadway as is possible.

- Where possible, the power line will run above steep slopes or road cuts so that disturbance is minimized and the power line can be removed from visual prominence. When placement of poles on steep slopes is necessary, it will be accomplished by hand without the use of heavy machinery.

- Poles will be a natural, dark stained color to blend into the landscape. Insulators and other attachments on the poles will also be in natural earth tones with non-reflective qualities.

Hayden Hill Road Intersection with Highway 139

The only area that this is a concern is the one mile stretch of right-of-way north of the junction of Highway 139 with Hayden Hill Road. According to the VQO map, both sides of Highway 139 in this section are rated Retention. Since the power line would be located in the foreground and, thus be evident, it would not meet the management objective. The area just north of this section is rated Partial Retention which would permit the power line to cross over to the west side of the road and access Hayden Hill Road across private land. However, to accomplish this, the power line would cross the open and scenic valley and could cause greater visual disturbance to the traveling public than maintaining the proposed alignment. As stated earlier, the east side of Highway 139 has steep slopes and road cuts which can locally affect the Retention rating. To ensure that the proposed alignment is less visually disruptive than the alternative of crossing Highway 139 to the north, the following mitigation measures will be done:

- A power line located above these cuts in the trees could be relatively well hidden from the traveling public. The proposed alignment will be used, and the line will traverse the roadway from a pole located behind trees on one side to another pole in the trees on the other side.

4.2.11.5 Unavoidable Adverse Impacts to Visual Resources

Hayden Hill Project

In most cases, the visual effects of the mine will be unavoidable and will last the life of the mine and beyond. Initial mining activities will not meet the VQOs for the area for views from Highway 139. Disturbance to the landscape due to stripping of growth media during the initial phases of the pits will represent short-term, adverse visual impacts from this route. Views of the waste rock dump and the top of the pit will represent the highest visual impact with the longest duration from this viewpoint. Successful reclamation efforts will result in landforms and vegetation types and patterns that are harmonious with the surrounding landscape, if the Reclamation Plan and mitigation measures are followed. Visual impacts to the view of the top of Hayden Hill from Highway 139 will not be significant.

Views from the access roads will be adversely impacted during the life of the Project and until reclamation is complete. However, these roads are of secondary concern and existing views are to previously disturbed areas. The resulting change in the quality of the view will be relatively minor. Impacts to views from the access roads are not considered significant.

The open pit design of the mine will be an unavoidable adverse impact for the life of the mine and will continue to impact the visual quality if proposed reclamation efforts are not carefully executed or successful. After completion of reclamation as presented in the Reclamation Plan, including proposed mitigation measures, this impact will not be significant.

Hayden Hill Power Line

There would be no unavoidable adverse impacts to visual resources if the power line is properly constructed and maintained.

4.2.11.6 Cumulative Impacts

No significant cumulative impacts have been identified for visual resources.

4.2.12 Transportation

4.2.12.1 Issues, Concerns and Opportunities

The issues and concerns related to transportation are listed below:

1. What will be the impacts to public safety due to the Proposed Action?

2. What will be the impacts due to hazardous substance transport in the area of influence?

3. What conflicts with other users, such as loggers and ranchers, will be manifest on existing roads due to the Proposed Action?

All transportation issues are addressed in Section 4.2.12.2. A brief discussion of the proposed hazardous materials handling procedures are found in Section 2.2.8.10.

4.2.12.2 Impacts due to Transportation

Pre-Production Phase

The Applicant estimates that pre-production phase traffic will average 25 to 30 personal vehicle round-trips per day and 10 to 15 commercial vehicle round-trips per day. No peak traffic volumes are provided. Because the level of traffic associated with the pre-production phase of the Project is relatively small and the roads in the transportation area of influence currently carry relatively low volumes of traffic (with the exception of U.S. Highway 395 from the Lassen County line north to Johnstonville), the additional volume of traffic associated with pre-production should not create a burden on these highways and roads. In general, if the vehicles transporting construction equipment and materials do not exceed legal weight limits, the additional traffic associated with the pre-production phase of the Project should not significantly reduce the life of the highways and roads.

However, there is concern that heavy truck traffic traveling east to Hayden Hill on California Highway 299 may elect to use County Road A2 as a shortcut to California 139. A substantial amount of heavy truck traffic would accelerate deterioration of the road which is already in fair to poor condition.

Once right-of-ways are obtained, LGMI will upgrade and maintain Hayden Hill Road, relieving Lassen County of its current maintenance duties for the life of the Project.

Operations

LGMI estimates that daily round-trips during operations would average 10 to 15 per day for vehicles transporting workers and 3 to 5 trips per day for commercial vehicles. This low volume of traffic would not result in a decrease in level of service on any highway or road within the area of influence nor would it result in substantial deterioration to highways or roads.

A Transportation And Maintenance Plan will be developed. This plan will establish maintenance responsibilities for LGMI and establish the appropriate level of maintenance for each road.

There is concern in the Lassen County Department of Public Works for the transporting of cyanide, reagents and blasting agents through the City of Susanville on California Highways 36 and 139. Although Lassen County is currently developing an emergency response plan, hazardous materials spills training for local law enforcement and emergency response personnel is considered to be inadequate (Harvey 1990).

It should be noted that, during heavy snowfalls, California Highway 139 between Susanville and Hayden Hill is subject to blowing and drifting snow. This road is not maintained in terms of snow removal at the same level as U.S. Highway 395 or California Highway 299. Therefore, Hayden Hill employees may be prevented from reaching work on schedule during heavy snowstorms.

4.2.12.3 Mitigation Measures for Transportation

Transportation mitigation measures include the following:

- LGMI could establish internal policies that discourage vendors and employees from using County Road A2;
- LGMI could offer training and equipment to Lassen County and the City of Susanville to help them respond to spills of hazardous materials;
- LGMI could establish employee transportation programs to encourage reduction of the number of trips per day.

4.2.12.4 Unavoidable Adverse Impacts Due to Transportation

Taking into account the mitigation measures planned by the Proposed Action and those described above, there will be no unavoidable adverse impacts due to transportation.

4.2.12.5 Cumulative Impacts Due to Transportation

LGMI estimates that daily round-trips to Hayden Hill during operations would average 10 to 15 per day for vehicles transporting workers, and 3 to 5 trips per day for commercial vehicles. That volume of traffic from commuting to work at Hayden Hill and from commercial vehicles would not result in a significant decrease in a level of service on any highway or at any intersection, even when added to the effect of the increased traffic due to expansion of the California Corrections Center near Susanville.

The draft EIR/EIS for the Corrections Center refers to a study that analyzed existing traffic volumes and levels of service near the Center's site, southeast of Susanville. Using the reserve capacities given in that study, it is clear that other roadways and intersections would be able to absorb Hayden Hill's worker and commercial trips without a decline in the levels of service. The study concluded that peak-hour levels of service would continue to be acceptable at all intersections and roadways with three exceptions: 1) The intersection of US 395, California Route 36, and Richmond Road; 2) the intersection of Johnstonville Road and Center Road; and 3) the intersection of Rice Canyon Road and Center Road (Kaku 1991). The three exceptions are discussed below.

At the intersection of US 395, California Route 36, and Richmond Road, mitigation measures (the installation of two-phase traffic signals) would handle growth in traffic, both with and without the proposed expansion to the Corrections Center. The intersection is projected to function at a level of service A, or an excellent level of service, even during peak periods. That level of service is projected with the Corrections Center operating at 100 percent and 190 percent of design bed capacity (Kaku 1991). If every work and commercial trip projected for the Hayden Hill Project were to pass through the intersection (a highly unlikely event), the additional trips attributable to the Hayden Hill Project would not exceed the reserve capacity stated in the study for the signalized intersection. Stated another way, the addition of all of the traffic projected for the Hayden Hill Project to the traffic projected by the study for the intersection would not deteriorate the level of service below A.

The two intersections of Johnstonville Road and Center Road, and Rice Canyon Road and Center Road, are projected to have levels of service D at the evening peak with the expansion of the Corrections Center. Neither intersection is likely to be used by the commercial vehicles or workers at the Hayden Hill Project, but if every commercial and commuting trip projected for the Hayden Hill Project passed through these two intersections, that traffic would not lower the reserve capacity of the intersections sufficiently to change the level of service.

Additional trips will be made by the 365 new persons (workers and their families) projected to be gained from the Hayden Hill Project, when operational. These trips, however, will be dispersed throughout Lassen and Modoc counties, and not concentrated near the Corrections Center or the Hayden Hill Project. Therefore, these trips will be a negligible component in the cumulative impacts on any highway or intersection near the Hayden Hill Project or the Corrections Center.

It is contemplated that the proposed Lassen College Cogeneration Project at Susanville would result in some cumulative effects. At the time of this analysis the effects of the Cogeneration Project are unknown.

4.2.13 Recreation

4.2.13.1 Issues, Concerns and Opportunities

The issues and concerns related to recreation are listed below:

1. What will be the impacts to the existing recreation in the area?

Issues and concerns listed are discussed in the recreation section, 4.2.13.2.

4.2.13.2 Impacts to Recreation

Given the relatively small increase in area population that would be associated with the Proposed Action, potential impacts on the area recreation resources would be minimal. Therefore, the area of influence for potential recreation impacts was limited to the Hayden Hill Project site and vicinity (SRK 1990).

Project Site

The fragmentary remnants of the Hayden Hill town site and mining district would be eradicated under the Proposed Action, except for the town cemetery which would be fenced and preserved. Supervised access would be provided to the cemetery during operation of the mine (see Section 2.2.7.1). Loss of the historic town site and mining district, in its current condition, would constitute an irreversible impact to a relatively unique recreation resource in the BLM Planning Area. However, the fragmentary nature of the remains of the town site limit its current value as a recreational resource. Further, the elimination and eventual reclamation of a number of hazardous remnants of underground workings and above-ground pits coupled with the potential for the LGMI operations to become a relatively unique tourist attraction in the area, particularly if guided tours are offered, serve to offset the change of condition of the historic district as a recreation resource.

The CDFFP fire lookout tower will be replaced at Snag Hill. Replacement of the fire tower would provide an additional recreational resource. The Proposed Action would also eliminate the rockhounding that currently occurs on the Project site; however, other sites for this activity exist within the general area. The High Grade Mining District near New Pine Creek and the Winters Mining District, north of Adin are available for rockhounding. This impact is not considered significant.

Vicinity

The deer, antelope and upland game hunting activities that occur in the immediate vicinity of the Project site would be adversely affected by the Proposed Action in that the noise and activity associated with both pre-production and Project operations phases would affect abundance and quality of wildlife and their habitat. These effects would diminish rather rapidly with distance from the Project site and would be expected to disappear completely as successful reclamation occurs after Project completion. During construction and operations, the quality of the hunting experience would be affected by the noise, activity and visual effects of the Project. Although waterfowl and habitat in the game refuge are expected to be minimally affected because of distance, the quality of the recreational experience would be similarly affected for the relatively few bird watchers who use the area.

There are numerous other deer, antelope and upland game hunting and bird watching alternatives within the general area; therefore the temporary impacts on the experiences of these recreational users do not represent a substantial loss. No adverse impacts to angling are expected as a result of the proposed action.

Given the relatively low volumes of Proposed Action-associated traffic projected for California Highway 139, the hiking and picnicking use that occurs in the riparian areas and meadows along the highway north of Hayden Hill Road would not be substantially affected.

There is a potential for competition between recreational users and Project construction workers for camp sites at the Willow Creek Campground. This is considered a short-term impact which would no longer exist after Project construction was completed.

4.2.13.3 Mitigation Measures for Recreation

Potential mitigation measures for impacts to recreational resources include the following:

- LGMI should design Project access routes to allow continued access to the public lands adjacent to and beyond the Project site; and

- LGMI should develop an observation turnout from the access road that allows viewing of the Project site. The turnout should be provided with signs and exhibits that describe the historic mining district and current mining activities.

- Long-term usage of local campgrounds by Project related workers could be discouraged through the strict enforcement of the 14-day stay limit. The Applicant will direct contractors to not set up residence camps at the campground, by adding this condition to their contracts.

4.2.13.4 Unavoidable Adverse Impacts to Recreation

The alteration and demolition of the Hayden Hill Mining District as it presently exists, will be unavoidable. However, the historical value of the area will not be lost and the new mining operations will provide a future source of recreation. This impact is not considered significant.

4.2.13.5 Cumulative Impacts

No significant cumulative impacts were identified for recreation.

4.2.14 Noise

4.2.14.1 Issues, Concerns and Opportunities

The issues and concerns related to Noise are listed below:

1. What are the impacts to the existing area of influence?

2. What are the impacts to wildlife?

Issues 1 and 2 are discussed in Section 4.2.14.2 below.

4.2.14.2 Impacts Due to Noise

General Site

The Proposed Action includes operations of the mill, crushers, drill rigs, bulldozers, front loaders, haul trucks and other vehicles. Noise from these sources was evaluated by a combination of noise measurements and accepted modeling techniques. The site noise analysis report (Brown 1990) details the noise methodologies and modeling procedures used.

Figure 4.14-1 shows the predicted location of the 40 decibel (dB) average noise level (L_{eq}) contour, which corresponds to the Lassen County Noise Element nighttime noise performance standard at residential land uses. This contour extends beyond the Project boundaries, but does not include any existing residences. Satisfaction of the Noise Element standard would require that the land within the 40 dB L_{eq} contour be zoned for other than residential land uses. This is the case with the Project site, so no significant adverse impact is expected in terms of the hourly noise level performance standards.

The predicted average noise levels produced by mining operations would be at or below ambient noise levels at the nearest recreational facility (Willow Creek campground). Noise from mining activities could be perceptible to people staying at that campground at night. Noise from the Project would probably be imperceptible at the campground during daytime hours.

Figure 4.14-2 shows the Day-night Average Level (L_{dn}) contours predicted for a typical 2-shift work day. The Lassen County Noise Element states that the noise level at the property line must not exceed 70 dB L_{dn}. The 70 dB L_{dn} contour predicted for typical operations lies well within the Project boundaries. There would therefore be no adverse impact in terms of the property line noise standard.

Blasting

There are no blasting noise or vibration criteria in the Lassen County Noise Element. The U.S. Government Office of Surface Mining Reclamation and Enforcement (OSM) regulates airblast and vibration caused by blasting at coal mining operations as mandated in Part 816 of the OSM regulations. Although the OSM standards do not apply directly to the Project, the criteria outlined by the OSM may be used to analyze the potential impacts of blasting noise and vibration.

Generally, the OSM regulations require the mine operator, during blasting, to prevent personal injury and damage to public and private property outside the mining permit area. Periodic monitoring, by a certified blaster, of airblast standards is required. Peak overpressures due to airblasts and ground vibration standards are also specified by the OSM regulations. See the technical report on noise on file at the Lassen County Planning Department for a detailed discussion of these standards.

Vibration due to blasting would be controlled to prevent damage to the mill building, which is within the Project boundaries. Because vibration is reduced with increasing distance from the blast site, it is not anticipated that vibration due to blasting would adversely affect adjacent properties.

Airblast overpressure is anticipated to be less than 129 dB at distances greater than about 200 feet from the blast site, which means that airblast levels would be within acceptable limits as established by the OSM beyond that distance. The predicted airblast level at a distance of 1600 feet from the blast site would be about 115 dB, which means that airblast levels would not be expected to result in significant complaints beyond that distance.

Wildlife

Literature search of existing published studies indicates there is no conclusive evidence that noise emissions, similar to those anticipated to be generated by the Proposed Action, would have a serious adverse impact on the behavior, reproduction, and survival of domesticated and wild animals in the Project area.

Domesticated animals exposed to periodic sound emissions in the approximate range of 80-120 dB showed no significant measurable affects in the areas of behavior, reproduction, productive capacity, or mortality (Bond 1963, 1970, 1971; Brewer 1974).

Studies involving wildlife are directed primarily to the possible effects of noise generated by supersonic and low-level aircraft overflights. Studies on sea birds, shore birds, and waterfowl exposed to noise in the 55-100 dB range suggest that behavioral responses are typically generated at noise levels of approximately 80 dB (Awbrey 1980; Brown 1990), but reproductive activity including breeding, incubating, brooding, and nest success was not adversely affected (Black et. al 1984; Dunnet 1977). Studies on raptors suggest no detrimental impact to the reproductive success and aerie reoccupancy rates result from supersonic aircraft noise (Ellis 1981, 1985); and moreover, some raptor species easily habituate to noise disturbances (Anderson et. al 1990; Bunsel et. al 1980). Studies of bighorn sheep and mule deer indicate that sonic boom aircraft disturbances have no observable behavioral effects on these big game animals, except during low-level overflights where sound levels were over 100 dB (Lamp 1987). Studies on pronghorn antelope calculated noise levels of no reaction and strong reaction were approximately 60 and 70 dB, respectively (Luz 1976).

A lesser number of studies have been completed for noise disturbances to wildlife as a result of blasting and mining activities. However, the conclusions are very similar to those determined for aircraft generated noise. Blasting operations related to harbor construction on Saint George Island, Alaska had no apparent affect on the reproductive performance, phenology, attendance patterns, and populations at nearby nesting sea bird colonies (Cumo 1987). There have been observations that prairie falcons may selectively avoid areas of intense mining disturbance (Bednarz 1984), however, more scientific studies have concluded blasting does not need to be restricted from occupied prairie falcon nest sites provided that peak noise levels do not exceed 140 dB at the aerie, and that no more than 3 blasts occur on a given day or 90 blasts during the nesting season (Holthuiszen et. al undated). A study monitoring the effects of blasting on Northern fur seals and sea bird species indicated that construction noise of 75 and 85 dB at the source had no measurable affect on animals located 500 and 1000 meters away, respectively (Gentry 1990). In Southeastern Idaho, a controlled study to evaluate the affect of simulated mine disturbances on cow/calf elk behavior indicated that mine disturbances altered the movement and habitat selection patterns of elk, but disturbances did not promote calf abandonment or affect winter survival (Kuck 1985).

In consideration of the aforementioned studies, no significant adverse impact upon wildlife is anticipated as a result of noise levels generated by the Proposed Action, as no quantifiable adverse impacts upon wildlife can be ascribed to other similar noise exposures.

4.2.14.3 Mitigation Measures for Noise

The Project would not result in significant adverse noise or vibration impacts upon adjacent land areas. Therefore, no noise or vibration mitigation measures would be required. However, these conclusions are based upon certain operational assumptions which affect noise and vibration levels. Those assumptions, which constitute noise mitigation measures inherent in the Project design, are listed below:

- Heavy equipment will be fitted with adequate mufflers and engine enclosures as provided by the equipment manufacturers.
- Blasting will be conducted in accordance with MSHA regulations, which require periodic airblast and vibration monitoring and oversight by a certified blaster.
- Blasting will be conducted to prevent damage to the mill building and other sensitive structures within the Project boundaries.
- Air blast and vibration would be controlled so as not to exceed regulatory criteria at adjacent noise sensitive properties.
- Blasting will be done only during daylight hours.

4.2.14.4 Unavoidable Adverse Impacts

Noise levels in close proximity to the pit will reach 60 to 70 dB during operations (Figures 4.14-1 and 4.14-2). Although these noise levels are not extremely high and will not be manifest at the Project boundary, they do represent a potential adverse impact to the area immediately adjacent to the pit. Therefore this impact is considered significant. Noise from Project activities and blasting in this very quiet area will be perceptible as far away as the Willow Creek Campground.

4.2.14.5 Cumulative Impacts

No significant cumulative impacts were identified for noise.

4.3 Project Alternatives

There are ten alternatives suggested for the proposed Hayden Hill Project including the No Action Alternative. Detailed discussion of these alternatives may be found in Chapter 2.0. Foreseeable significant impacts caused by each alternative, if implemented, are discussed in the following sections. Only those impacts that would not be mitigated by the Proposed Action are discussed in detail.

Standard mitigation measures incorporated into the Project design and Reclamation Plan, discussed in Chapter 2.0, would also apply to the alternatives. Additional mitigation measures to avoid or reduce impacts, if the alternatives were implemented, are discussed below. In addition, unavoidable adverse impacts are discussed below the Alternatives in which they were identified.

4.3.1 No Action Alternative

The No Action Alternative would eliminate those negative impacts which the Project would generate. However, it would also eliminate those beneficial impacts the Project may generate.

4.3.1.1 Impacts Associated with the No Action Alternative

Geology and Topography

If the No Action Alternative would be implemented, the ore body would remain in the ground. Exploration on and around the site would probably continue. Interest in the mineral resource would continue and plans for a similar operation may be submitted in the future by other mining companies. Hayden Hill would not be modified by the development of an open pit, which would introduce an unnatural landform to the area.

Soils

Selection of the No Action Alternative would mean the site would remain in its present condition. The impacts to soil resources as a result of the Proposed Action would not occur. However, reclamation of the existing 200 acres of disturbance, a beneficial aspect of the Project, would also not occur. The present erosion and sediment rates would continue. These rates are elevated due to the present disturbance on site.

Vegetation

If the No Action Alternative would be implemented, the Project site would remain in its present condition. The population of *Antennaria flagellaris* would not be lost. No increased potential for impacts would occur, however, the existing 200 acre disturbance to vegetation proposed to be reclaimed in the Proposed Action, would not be reclaimed.

Wildlife and Aquatic Resources
Selection of the No Action Alternative would leave the Project site in its present condition. No additional impacts to wildlife would occur and the potential for the introduction of additional toxic run-off and sediment to aquatic habitats in the Project area would be eliminated.

Water Resources
The No Action Alternative would not increase the potential for surface and groundwater contamination due to mining operations. The increased potential for the development of ARD and the leaching of heavy metals from the facilities would not exist. The diversion of surface drainages would not be required. The groundwater that will be pumped and used for the Project would not be used and, therefore would be available for other uses. The seeps in the immediate vicinity of the pit and supplied by the local perched groundwater system, would not be affected. Pit excavation would not occur, thereby not affecting the seeps. No mitigation measures to protect water quality would be necessary.

Air Quality
Under this alternative, the concentration of contaminants would remain low and air quality would remain high. Concentrations of all regulated pollutants would remain within ambient standards. No mitigation would be required.

Socioeconomics
The No-Action Alternative would eliminate, for the time being, the impacts discussed in Section 4.2.8 associated with additional employment, income and local government revenues stemming from the Proposed Action. This alternative would also eliminate the demands on local government facilities, services and per capita operating expenses generated by immigrating Project employees and induced workers. The beneficial aspects of the project, jobs, and increased revenues would not be realized if the No Action alternative were enacted.

Land Use
The No Action Alternative would not impact the existing land uses. Current land uses are compatible with the regulatory agencies management plans, therefore reclassification of land use would not be necessary. Grazing allotments would not be affected. The State wildlife refuge would not be reduced in size by 530 acres.

Cultural Resources
The No Action Alternative would eliminate direct impact to cultural properties within the Proposed Project area. There would be no alteration or destruction of prehistoric sites, historic archaeologic sites and historic architectural sites resulting from the Proposed Action. There would be no adverse physical or aesthetic effects to historic buildings, structures, or objects resulting from the Proposed Action. The

existing Hayden Hill fire tower would not be impacted, and replacement or relocation would not be required.

Deterioration of historic buildings and structures would continue from exposure to weather and natural elements. Alteration or destruction of prehistoric or historic sites could occur from continued exploration, and by hunters and tourists.

Visual Resources

The No Action Alternative would leave the site as it presently exists and the Project would not be constructed. No additional visual impacts would occur. The visual impacts caused by pre-existing scars from roads, adits, and drill sites would remain present at the site. These visual impacts do not meet the VQOs for this area.

Transportation

The No Action alternative would not increase traffic volumes and potential impacts to highways and roads.

Recreation

The potential impacts described in Section 4.2.13.1 would not occur under the No-Action Alternative.

Noise

Increased noise in the vicinity of the mine site would not occur.

4.3.1.2 Mitigation Measures Associated with the No Action Alternative

Implementation of the No Action Alternative would mean that the Proposed Action would not be developed. Since no increased potential for impacts to the environment would occur, no mitigation measures would be necessary.

4.3.2 Pit Backfilling Alternatives

It is planned in the Proposed Action to dispose of all of the waste rock in one waste rock dump located on the northwest side of Hayden Hill. Two Project alternatives are proposed that, if implemented, would affect the size of the final waste rock dump. These alternatives are to totally backfill the pit, the Comprehensive Backfilled Pit Alternative, or to partially backfill a portion of the Providence zone, the Partially Backfilled Pit Alternative.

Some deposits mined commercially have fixed boundaries. An example of such a deposit is a coal seam, which is tabular in nature with fixed upper and lower boundaries. Ore zones of gold deposits such as Hayden Hill have boundaries which are defined by mineralized material which can be mined at a reasonable return on investment, known as ore, and mineralized material which cannot be mined economically, or protore. This demarcation is effected by geologic, operational, and economic criteria and is predictable within limits of the original data, reasonable geologic interpretations, and current economics. However, it is likely to change as mining progresses and new information is collected from ongoing geologic studies of the deposit. Changing metal prices, mining and processing costs, as well as new advances in mining and processing technology will also dictate adjustments in the boundary between economic and non-economic mineralization during the life of the operation.

The open pit approach used in precious metals mining, as opposed to surface coal mining, is to follow a geologic structure to great depth in an attempt to recover the ore. This often precludes any actual backfilling of the pit until the deposit is completely mined out. The mining sequence at some open pit operations will allow one pit to be completely mined prior to opening a second pit. If viable, the first pit can be used as a depository for waste material from the second pit. This is referred to as sequential backfilling. The backfilling of the Providence zone, the Partially Backfilled Pit Alternative, would require sequential backfilling. Backfilling the entire pit area, the Comprehensive Backfilled Pit Alternative, could not commence until after completion of mining.

A waste rock dump would be required for both alternatives, however, the final dump would be smaller than that of the Proposed Action, or totally eliminated. Those resource areas impacted by the Proposed Action waste rock dump would be impacted by these alternatives as well. Impacts from these alternatives would be economic as well as environmental. If gold prices rise in the future, any backfilling of the pits may make exploration and development of the mineralized zones located under the backfilled areas uneconomic.

4.3.2.1 Impacts Resulting from the Comprehensive Backfilled Pit Alternative

The Comprehensive Backfilled Pit Alternative would require hauling material from the waste rock dump back to the pit after mining is concluded, extending the Project life by approximately four years. Comprehensive backfilling of the pit would eliminate the waste rock dump and allow the post-mining topography to be reclaimed to resemble the existing surface. Thirty percent (30%) of the original rock volume will be processed as ore and would not be placed in the waste rock dump. Including a projected long-term swell factor, (i.e. the increase in material volume caused by breaking a solid rock mass into fragments), the remaining material will only restore 80 percent of the original volume. However, this second handling of the material would assess costs and impacts similar to the initial mining as well as waste a potentially valuable future resource.

Impacts and mitigation measures for environmental resources affected by the Comprehensive Backfilled Pit Alternative are described below. Economic impacts are discussed as well. Those resources not affected by this alternative are land use, cultural, and recreation.

Project Economics

The most costly part of most mining projects are the materials handling costs associated with moving the millions of tons of ore and waste rock. In a recent memorandum to the California State Director of the BLM, the U.S. Bureau of Mines states:

> "The single most significant aspect of backfilling open pits is cost. For typical open pit operations, loading and hauling material is the largest mining cost component (excluding mineral processing). Backfilling essentially doubles the cost of loading and hauling. This could make an otherwise profitable mine uneconomic to develop and operate."

Under current economic conditions, the Applicant estimates that backfilling the proposed pit would increase the cost of the Project by approximately $0.75 per ton of waste rock or $64.3 million dollars. This effectively doubles the handling costs of the Project as well as the associated impacts to other environmental resources, such as water use and air quality.

The Applicant predicts backfilling will add an additional four years or approximately 915,000 man hours to the Project. The equipment required to backfill the pit is as follows:

TYPE	SIZE	QUANTITY
Loaders	13.5 CYD.	3
Haul Trucks	85 ton	10
Motorgrader	16G	2
Bulldozers	D9	2
Water Trucks	10000 gal	2
Repair Vehicles	3/4 ton	6
	2 ton 2	
Manvans	15 passenger	7

With the exception of the two motor graders, the equipment requirement is similar to the Proposed Action.

Non-renewable resources consumed during backfilling would include:

TYPE	USE	QUANTITY USED
Diesel Fuel	Heavy Equipment	11,919,000 gal
Gasoline	Other Vehicles	595,000 gal
Oils and Lubes	All Vehicles	370,000 gal

Future Mining Potential

Open pit deposits are mined as roughly conical pits which are developed by advancing the pit walls and bottom incremental to the limits of the ore material. The final pit walls will contain mineralized material which cannot be economically recovered at the time of mine closure. These lower grade zones may be mined profitably at a future date under improved economic conditions (e.g., higher precious metals prices, or with the development of new mining or mineral processing technologies.)

Backfilling the pit would bury these low-grade zones, thereby making future mining of these potential reserves much more difficult and expensive. The additional costs required to re-excavate the waste rock to reach the ore could prevent future mining and preclude the significant economic benefits to society derived from that natural resource development.

The Applicant's current reserve estimate of 45.3 million tons of ore is based on expected Project costs and a gold price of $400.00 per ounce. An increase of $200.00 in the price of gold would add 39.3 million tons (86 percent) to the estimated reserves. The mineralization at Hayden Hill is unbounded at depth. However, the additional costs of re-excavating previously mined waste material from the backfilled pit could preclude future mining of this mineralized material until the price of gold reached $1150.00 per ounce.

Geology and Topography

Total backfilling of the pit will restore 80 percent of the original volume, leaving only the minimal amount of pit highwalls, and eliminating the region's topographic impact. The modification of Hayden Hill would still occur. Therefore, this alternative will not reduce the impact to Hayden Hill as a physical feature. The unmineralized material placed back in the pit during backfilling could obscure information critical to the geologists' search for additional ore in the Hayden Hill gold deposit, resulting in a long-term adverse impact. It is stated in 43 CFR 3809.0-5:

> "Reclamation may not be required where the retention of a stable high wall or other mine workings is needed to preserve evidence of mineralization."

Soils

Total backfilling of the pit would not change the estimates of growth media availability presented in Table 3.3-5. This alternative would not require additional lands to serve as a temporary waste rock dump because the proposed site would be used. Growth media underlying the temporary dump site may be lost or altered by any leachate traveling through the temporary waste rock dump.

Total backfilling would increase water and wind erosion and run-off compared to the Proposed Action due to the extended time without covering vegetation.

Vegetation

The vegetative disturbances for the Project under the Comprehensive Backfilled Pit Alternative would be the same as the Proposed Action. Waste rock would be temporarily placed in a waste rock dump similar in ground disturbance potential to the Proposed Action. The dump would not be as high and not contain as much volume, but the disturbance area would be equal (White 1990).

Re-vegetation, however, would vary slightly. Under the Proposed Action only the pit benches would be reclaimed. Under this alternative, the majority of the benches would be covered by waste rock and reclaimed. Approximately 80 percent of the pit would be backfilled, based on a 1.9 to 1 waste rock to ore ratio stated in Section 2.2.2 of Chapter 2.0 and a long-term swell factor of approximately 20 percent. Approximately 150 acres of the 176 acres of pit disturbance would be reclaimed as compared to 122 acres for the Proposed Action.

In addition to disturbance acreage, the timing of reclamation would also vary. Under the Proposed Action the waste rock dump would be constructed from the top down and would be reclaimed concurrent with construction. Backfilling the pit would require the waste rock dump to be left unreclaimed until the time of mine closure when it would be replaced in the pit. The longer time of exposed disturbance would increase erosion and sediment potential downstream of the waste rock dump. These additional impacts are considered short term, adverse.

Wildlife and Aquatic Resources

The amount of disturbance would remain the same to wildlife for the life of the mine but backfilling would preclude the post mine use of the pit for raptor rock outcrop nesting habitat. Revegetation of the area to suitable forage beneath the waste rock dump would begin eight to ten years later than the proposed concurrent revegetation during the mine life. Wildlife would be able to resume pre-mining patterns.

Total backfilling of the mine pit would not eliminate the need for at least temporary waste rock dump storage at the head of Preston Canyon drainage, or an alternate location would be required for stockpiling of waste rock prior to backfilling. The area of disturbance and the potential for sedimentation would be similar to the Proposed Action.

Water Resources

Comprehensive backfilling of the pit would remove the waste rock dump from the site. This would lessen the potential impacts to the surface waters downgradient of the Proposed waste rock dump. However, the potential impacts to groundwater would increase slightly.

Water percolating through the backfilled pit, from precipitation events and the perched system, may pond in the pit area and supply a hydraulic pressure head which could allow for percolation of contaminates into the groundwater. Because the hydrogeologic structure of the area includes faults and fractures and the regional water table is deep, the potential of groundwater contamination due to percolation is low. Bench testing of the waste rock also indicates that the potential for ARD and the leaching of heavy metals is low. Other potential impacts would be the same as for the Proposed Action.

Comprehensive backfilling will prolong operations for an additional four years. Water consumption for dust control will, therefore, be increased for an additional four years.

Air Quality

The additional handling of the waste rock material (transport from the waste rock dump to the pit) will result in emissions of PM10, NO_2, and CO. Because backfilling will take place after mining is completed, the total emissions generated from the Proposed Action during mine life will remain the same. However, the emissions resulting from this alternative will continue to impact air quality for an additional four years. The impacts to air quality from this alternative are not expected to be greater than those estimated for the Proposed Action during mine life, and will not be significant.

Socioeconomics

The Comprehensive backfilling alternative would have greater impacts to socioeconomics than the Proposed Action. The additional four years of operations required for comprehensive backfilling would further compound the impacts to socioeconomics.

Visual Resources

The waste rock dump would create the same visual impacts from Highway 139 as the Proposed Action during the life of the mine. However, the size of this dump would diminish in size as the pit is backfilled following mining, lowering the visual impacts caused by the waste rock dump. Long term visual impacts would be less than the Proposed Action since the waste material would be reclaimed in the pit areas, leaving only a minimal amount of pit highwalls and steep slopes un-revegetated.

Transportation

Impacts to transportation would be extended an additional four years due to the increased Project life.

Noise

Impacts to noise would be extended an additional four years due to the increased Project life.

4.3.2.2 Mitigation Measures for the Comprehensive Backfilled Pit Alternative

Soils

In regard to leachate impacting the sub-soils of the temporary waste rock dump:

- Growth media will be salvaged from the waste rock dump area prior to placement of waste rock. The growth media will be stockpiled as in the Proposed Action.

In regard to the increased water and wind erosion potential caused by the extended period of un-revegetated soil of the temporary waste rock dump:

- Interim revegetation will be performed on the temporary waste rock dump.

- Sediment control procedures will be developed for this alternative independently of the Proposed Action if it is adopted.

Vegetation

The major impact differences for this alternative are a result of the waste rock dump not being concurrently reclaimed as in the Proposed Action. Therefore, the following mitigation is proposed.

- Current interim reclamation will be performed following the temporary placement of waste rock in the dump.

- Sediment control measures will be developed and implemented for this alternative if it is adopted.

Water Resources

The mitigation measures for the Proposed Action would be required plus some additional measures listed below:

- An additional impermeable soil cap, installed across the top of the backfilled pit, is required to minimize infiltration of precipitation run-off.

- Semi-annual monitoring of ponded water in the pit for quantity and quality.

Should heavy metals be leached from the backfilled pit and/or ARD develop, the treatment problems become more complex than the Proposed Action. The chemistry of waters that may pond in the pit would be complex.

If groundwater rather than surface water becomes contaminated, the likelihood of which is low, expensive pumping and monitoring systems must be installed in addition to some type of water treatment plant. Groundwater contamination can be more costly to define and remediate at depth than surface water contamination.

Socioeconomics

Mitigation measures for socioeconomic impacts are presented below:

- Compensation for the additional four years of operations would need to be negotiated between LGMI and local governments.

- Transportation and housing procedures and policies necessary for the Proposed Action would have to account for an additional four years of operations.

Visual Resources

Mitigation measures for this alternative are presented below:

- The waste material will be used to shape the final pit areas to create landforms and slopes that are found in the surrounding landscape.

- Growth media will be spread over the waste material for revegetation purposes.

4.3.2.3 Unavoidable Adverse Impacts Resulting from the Comprehensive Backfilled Pit Alternative

The only remaining unavoidable adverse impacts following the application of the mitigation measures relate to erosion and sediment control, geology, and socioeconomics. The increased erosion sediment loads will be temporary as revegetation is expected to eventually be complete. The remaining impact would be short-term. This impact is not considered significant. Geologic evidence would be buried within the pits, making future exploration more difficult. This impact is considered adverse and significant. The extended life of the Project would prolong the fiscal operating deficits experienced by the schools. This impact is considered significant. The level of impact would depend on negotiated compensation with LGMI.

4.3.2.4 Impacts Resulting from the Partially Backfilled Pit Alternative

The Partially Backfilled Pit Alternative, if implemented, would require a sequential backfill of the Providence zone using waste material from the Lookout zone. However, the proposed processing at Hayden Hill calls for concurrent mining activity from both zones to meet ore blending requirements. This will necessitate mining access to the Providence zone during mining operations in the Lookout zone, precluding any substantial sequential backfilling until very late in the planned operation.

Haul distances would be reduced since the waste rock will be moved directly from the Lookout Zone to the Providence zone. The final waste rock dump would cover the same acreage as the Proposed Action, but would be lower in height and total volume. Mine life would remain the same as the Proposed Action.

Impacts and mitigation measures for resources affected by the Partially Backfilled Pit Alternative are described below. Those resources affected by this alternative are geology, vegetation, wildlife and aquatic biology, water, air quality, and visual.

Geology and Topography

The impact to topography would be slightly reduced, however, the majority of the pit would remain. The pit would remain an unnatural landform in the region. The unmineralized material placed back into the pit during backfilling could obscure information critical to the geologists' search for additional ore in the Providence zone of mineralization, resulting in a long-term adverse impact.

Vegetation

Impacts as a result of the Partially Backfilled Pit Alternative would not vary significantly from the Proposed Action. The disturbed area of the waste rock dump would remain the same. Slightly more flat, reclaimable area may be produced in the Providence zone of the pit, as a result of the backfilling. However, the actual acreage is not expected to be significantly greater than the Proposed Action.

Wildlife and Aquatic Resources

Partial backfilling would not lessen the amount of disturbed acreage and would not eliminate the potential impacts of the Proposed Action for wildlife and aquatic biology. Selection and implementation of the Partial Backfilled Pit Alternative could result in impacts to water quality, as discussed in water resources. Changes in or degradation of surface or groundwater could have a detrimental effect on the aquatic resources in the Preston Canyon drainage and Willow Creek.

Water Resources

Partially backfilling the pit would increase the potential impacts to water resources. The potential problems associated with the Proposed Action and those of the Comprehensive Backfilled Pit Alternative (Section 4.3.2.1) would result. Both surface and groundwater have the potential for contamination should heavy metals be leached from the waste rock and/or ARD develop. Other potential impacts would be the same as for the Proposed Action.

Air Quality

During the time that the waste rock is being hauled directly from the Lookout zone to the Providence zone, the haul distances will be shorter and the emissions generation (PM10, NO_2 and CO), would be slightly less than the Proposed Action. Impacts to air quality from this alternative would not be significant.

Visual Resources

Visual impacts resulting from this alternative during mine life would be very similar to the Proposed Action. However, partially backfilling the Providence zone of the pit would result in the partial creation of landforms more compatible with existing landforms, and a smaller waste rock dump than that of the Proposed Action. This alternative would cause slightly lower visual impacts than the Proposed Action.

4.3.2.5 Mitigation Measures for the Partially Backfilled Pit Alternative

Water Resources

Mitigation measure for this alternative would include those for the Proposed Action, plus the additional measures stated below:

- An additional impermeable soil cap, installed across the top of the backfilled pit, is required to minimize infiltration of precipitation run-off.
- Semi-annual monitoring of ponded water in the pit for both quantity and quality.

Visual Resources

- Waste material will be used to shape the Providence zone of the pit to create slopes that are found in the surrounding landscape.
- Growth media will be spread over the waste material for revegetation.

4.3.2.6 Unavoidable Adverse Impacts Resulting from the Partially Backfilled Pit Alternative

Evidence of geologic mineralization in the Providence zone would be buried making future exploration more difficult. No other unavoidable adverse impacts beyond those mentioned for the Proposed Action were identified for this alternative.

4.3.3 Waste Rock Dump Design Alternatives

Benching the waste rock dump from the top to the 5,750-foot elevation is planned for the Proposed Action. Two alternatives for waste rock dump design are to bench the dump all the way to the toe, the Complete Benching Alternative, and to smooth the benches out after completion of mining, the Smoothed Waste Rock Dump Alternative.

The land area that will be covered by each waste rock dump configuration is as follows:

Proposed Action	206 acres
Complete Benching Alternative	226 acres
Smoothed Slope Alternative	258 acres

4.3.3.1 Impacts Resulting from the Complete Benching Alternative

This alternative, if implemented, would require the waste rock dump be benched all the way to the toe of the dump. This would reduce erosion and increase stability below the 5750-foot elevation. Bench design and reclamation would be similar to the Proposed Action. This alternative would cause about 20 more acres of disturbance than the Proposed Action.

Impacts and mitigation measures for resource areas affected by the Complete Benching Alternative are described below. This alternative would beneficially impact soils, water, and visual resources. Impacts to vegetation and wildlife would be both beneficial and adverse. Impacts to air quality would be negligible.

Soils

Erosion would be less under this alternative than under the Proposed Action because of the reduction in length and steepness of slope below the 5,750-foot elevation. Approximately 20 more acres of disturbance to Brisco cobbly loam, Rickets gravelly loam, Fiddler gravelly loam, and Deven gravelly loam would occur.

Vegetation

The Complete Benching Alternative would create three additional benches to be re-vegetated on the waste rock dump (Figure 2.2-2). The total surface area to be reclaimed would be increased by approximately 10 acres. In addition, the long angle of repose face, from the 5,750-foot contour to the bottom of the dump, would be broken up into four shorter faces. This would lower velocities and volumes of run-off from this portion of the waste rock dump, thus, reducing erosion potential (SRK 1991). The Complete Benching Alternative would result in approximately 20 acres more disturbance of primarily Jeffrey Pine/Mountain Shrub and Upland Shrub vegetation. This additional disturbance of habitat and timber production values would constitute an additional long-term impact above the impacts of the Proposed Action. The impacts to vegetational cover would be short-term. The implementation of the HMMP, Appendix I, would reduce the habitat impacts to insignificant.

Wildlife and Aquatic Resources

An additional 20 acres of important Jeffrey Pine/Mountain Shrub and Upland Shrub habitat would be lost. Some additional rock outcrop habitat would be impacted. Erosion potential would be less than that of the Proposed Action, presenting less sediment to the Preston Canyon drainage and Willow Creek aquatic systems. The impact to wildlife would be greater, and to aquatics lesser, if this alternative were implemented. The implementation of the HMMP, Appendix I, would reduce the impacts to wildlife habitat to insignificant.

Water Resources

The potential impacts due to the Complete Benching Alternative would be less than the Proposed Action. Sediment loading to the Preston Canyon drainage would be less than the Proposed Action.

Air Quality

The addition of benches below the 5,750-foot elevation level would be more conducive to revegetation, resulting in a decrease in wind and water erosion. However, due to the low silt content of the waste rock material, PM10 impacts from wind erosion of the Proposed Action waste rock dump design are not expected to be significant. Affects to air quality from this alternative would be negligible.

Visual Resources

The addition of benches below the 5,750 foot level would be conducive to reclaiming the bench areas, resulting in a reduction in the overall visual impact of the waste rock dump. By revegetating the bench areas, the overall scale and mass of the dump is reduced or softened. Visual impacts would be lessened by this alternative. However, the additional benches would not be viewed from Highway 139 or the south.

4.3.3.2 Mitigation Measures for the Complete Benching Alternative

Vegetation

The major difference in impact with this alternative is the disturbance of 20 more acres of Jeffrey Pine/ Mountain Shrub and Upland Shrub vegetation. The mitigation for the Proposed Action, of planting 150 Jeffrey pine containerized seedlings per acre is recommended for this alternative.

4.3.3.3 Unavoidable Adverse Impacts Resulting from the Complete Benching Alternative

Unavoidable adverse impacts for this Alternative relate to vegetational disturbances. The disturbance of the Jeffrey Pine/Mountain Shrub and Upland Shrub vegetation, and its commercial timber value, as a result of the waste rock dump, is considered a long-term, adverse unavoidable impact but not significant. This alternative disturbs 20 more acres of these vegetation types than the Proposed Action. The disturbance of the habitat value of the vegetation is considered a long-term, adverse unavoidable impact and is considered significant.

4.3.3.4 Impacts Resulting from the Smoothed Waste Rock Dump Alternative

This alternative, if implemented, would require the benches on the waste rock dump be smoothed out after completion of mining, and the entire dump be revegetated instead of just the flat bench surfaces. The appearance of the waste rock dump would be more natural, decreasing visual impacts. This alternative would increase the Project life by one or two years. Approximately 52 additional acres disturbance would be caused by this alternative.

The resource areas not affected by the Smoothed Waste Rock Dump Alternative are geology and topography, land use, cultural, and recreation. Impacts and mitigation measures for those resource areas which are affected are described below.

Soils

This alternative would not change estimates of growth media availability presented for the Proposed Action. Erosion would be greater under this alternative than under the Proposed Action because of the increase in length of slope. Increased wind and water erosion would result, in the short term, from reworking dump surfaces over a 1- to 2-year period to achieve the 3H:1V slope.

Vegetation

An additional 52 acres of Jeffrey Pine/Mountain Shrub and Upland Shrub vegetation and associated habitat values would be disturbed under the Smoothed Waste Rock Dump Alternative. Concurrent reclamation would not be possible, since the dump will be regraded after mine closure. The long, unbroken slopes of this alternative would be the most susceptible of the three possible waste rock dump configurations to erosion due to higher velocities and concentrations of run-off (SRK 1991). However, the entire waste rock dump could be reclaimed, and if successful, the overall unreclaimed disturbance for the Project would be reduced from 137 acres to 54 acres. The lost cover values are considered short-term and the lost habitat and timber production values are considered long-term.

Wildlife and Aquatic Resources

An additional 52 acres of important Jeffrey Pine/Mountain Shrub and Upland Shrub habitat would be lost, a long-term, adverse impact. The potential for loss of some mature Jeffrey pine stands exists, as well as impacting additional rock outcrop habitat. Impacts to wildlife would continue one to two years longer than the Proposed Action.

The smoothed surface waste rock dump has the potential to increase the erosive potential of run-off and subsequent addition of sediment to the Preston Canyon drainage.

Water Resources

The impacts due to smooth benching would have a slightly greater impact to surface waters at the site than the Proposed Action. The flow rate of water running off the waste rock dump would be greater than the Proposed Action, thereby increasing the potential for surficial erosion. Increased erosion would result in greater sediment loading to downgradient drainages, thereby degrading surface water quality.

Smooth benching is anticipated to extend operations for an additional one to two years. Water consumption used for dust control would be extended for one to two more years.

Air Quality

This alternative would result in additional fugitive PM10 particulate emissions. These emissions would result from the earthmoving activities and final grading of the dump. The additional PM10 emissions will be generated after mining has been completed and will exist for one to two additional years. However, PM10 impacts are not expected to be significant due to the anticipated low silt content of the waste rock.

The PM10 emissions generated from wind erosion on the unreclaimed waste rock dump during the Project life would be minimal, and, therefore, not significant. Additional engine exhaust emissions would be minimal and not significant.

Socioeconomics

The potential impacts due to smooth benching would be greater than the Proposed Action. Smoothing would call for an additional one to two years of operations. Socioeconomic impacts would continue to be manifest during these two years.

Visual Resources

If reclamation for this alternative for the waste rock dump is completely successful, this alternative would more fully mitigate the visual impacts associated with the dump. The elimination of the benches would result in a more natural-appearing landform. Assuming growth media is adequate, a much greater percentage of the dump could be revegetated than the Proposed Action. However, erosion potential will be higher for this alternative, so reclamation success may be more difficult. Successful revegetation of the dump is necessary in order to reduce visual impacts from Highway 139. Reclamation would not occur until mining operations are completed, so during the life of the operation, the dump will be a visual impact to both Highway 139 and the access roads.

Transportation

Impacts to transportation would be extended one to two years due to increased Project life.

Noise

Impacts to noise would be extended one to two years due to increased Project life.

4.3.3.5 Mitigation Measures for the Smoothed Waste Rock Dump Alternative

Soils

In regard to the increase in potential for erosion on the smoothed waste rock dump:

- Sediment control structures will be re-evaluated for sufficiency.
- The entire waste rock dump will be reclaimed by covering with 12-inches of growth media, if available, and revegetated.
- Interim reclamation will be performed to protect the soil until Project closure.

Vegetation

The primary difference in impacts for this alternative are the additional 52 acres of Jeffrey Pine/Mountain shrub vegetation disturbance and the fact that concurrent reclamation is not possible. The following mitigation measures are proposed in the event this alternative is selected:

- 150 Jeffrey pine containerized seedlings per acre will be planted in all areas of disturbance related to the smoothed waste rock dump.
- Interim reclamation, consistent with that for the Proposed Action waste rock dump will be completed.

- The smoothing of the dump will be done in a manner which disturbs as little of the interim reclamation as possible and facilitates concurrent reclamation behind the smoothing operation.

Wildlife and Aquatic Resources

Approximately 230 acres of Jeffrey pine vegetation will be protected off-site to compensate for the loss of Jeffrey Pine/Mountain Shrub wildlife habitat for the Proposed Action. To mitigate the additional impact to this vegetation, the following will take place:

- 150 Jeffrey pine containerized seedlings per acre of disturbed Jeffrey Pine/Mountain Shrub habitat will be planted as part of reclamation.

Water Resources

Mitigation measures for the smoothed waste rock dump would necessitate reducing the quantity of sediment moving off the dump in surface water run-off. Reducing sediment quantities can be accomplished by:

- Designing and strategically locating sediment fences and sediment detention ponds along surface water drainages.

- Re-planting the waste rock dump slopes concurrent with operations would decrease potential sediment loss.

Air Quality

- The fall and slide distances of material being moved will be minimized to reduce the increased PM10 emissions generated by this alternative.

Socioeconomics

Jobs and revenues due to extended mining operations would continue for an additional two years, therefore, the following mitigation is proposed:

- Compensation for the additional one to two years of operations will be negotiated between LGMI and local governments.

- Transportation and housing procedures and policies necessary for the Proposed Action will account for an additional one to two years of operations.

Visual Resources

- Interim reclamation will take place to reduce visual impacts of the dump during mine life.

4.3.3.6 Unavoidable Adverse Impacts Resulting from the Smoothed Waste Rock Dump Alternative

Soils

The erosion and sediment impacts as a result of this alternative would be increased as compared to the Proposed Action. The impact would be short-term, adverse. This impact is not considered significant.

Vegetation

The disturbance of the timber production and habitat values of the Jeffrey Pine/Mountain Shrub vegetation as a result of the waste rock dump, is considered a long-term, adverse unavoidable impact. This alternative disturbs 52 more acres of this vegetation type than the Proposed Action. The disturbance of the cover value of the vegetation is considered a short-term, adverse unavoidable impact. The additional loss of the habitat value is considered significant while the other impacts are not. However, the implementation of the HMMP will reduce the habitat impacts to insignificant.

Wildlife and Aquatic Resources

The smoothed waste rock dump would cause long-term loss of 52 acres of important Jeffrey Pine/Mountain Shrub and Upland Shrub wildlife habitat. Much of this habitat would be considered near mature forest, which is important for goshawks and potential habitat for spotted owls. This impact is considered significant.

The extended Project life would extend the impacts to terrestrial wildlife due to human activity, noise, dust, etc.

This alternative would impact a larger area of the Letterbox and Preston Canyon watersheds. This would slightly increase sedimentation to these drainages potentially impacting Willow Creek aquatic biology. However, sediment modeling indicates the volume of sediment is negligible and will not affect aquatic biology. This impact is not considered significant.

4.3.4 Facilities Location Alternative 3

The Proposed Action heap leach facility location would require the covering of an area of wetlands associated with seeps, impoundments and pools. Facilities Location Alternative 3 is intended to reduce the impact to wetlands by avoiding the impoundment.

Impacts and mitigation measures to the resources affected by the location of the heap leach pad are described below. Those resource areas affected by the heap leach pad location are soils, vegetation, and wildlife and aquatic.

The acreage covered by the heap leach impoundment and the height of the heap pile for each alternative are as follows:

	Area Covered by Heap Leach Pad	Height of Heap Pile
Proposed Action	199 acres	120 feet
Facilities Location Alternative 3	210.5 acres	115 feet

4.3.4.1 Impacts Resulting from Facilities Location Alternative 3

Soils

This alternative requires the disturbance of approximately 38.7 acres of land which is not disturbed by the Proposed Action. The impact of the alternative on individual soil taxon is shown below:

Jellycamp	14.5 acres (net increase)
Patburn	2.7 acres (net increase)
Patburn, eroded	7.0 acres (net increase)
Dotta	6.0 acres (net increase)

Approximately 27.5 acres that would be disturbed by the Proposed Action will not be disturbed. The net gain in disturbed land is 11.5 acres. This alternative would increase the volume of suitable top soil by 1770 cubic yards. This impact is considered beneficial. The alternative would increase, by 11.5 acres, the area of duripan soils that would be excavated. This impact is not considered significant. There would be no other impacts to the soil resources compared to the Proposed Action.

Vegetation

Facilities Location Alternative 3 will disturb approximately 11.5 more acres of Low Sagebrush vegetation and associated habitat than the Proposed Action. The acreage of wetlands impacted will be reduced from 6.8 acres to a total of 2.5 acres.

The loss of the cover value of 11.5 acres of Low Sagebrush vegetation is considered a short-term, non-significant, impact. However, the habitat value of this vegetation type is high and the loss of this value is considered significant and long-term. Less wetland area will be impacted which is considered to be beneficial.

The implementation of the Wetlands Mitigation Plan, which is part of the HMMP, Appendix I, would render the habitat impacts insignificant.

Wildlife and Aquatic Resources

An additional 11.5 acres of Low Sagebrush habitat would be lost which indirectly impacts sage grouse and pronghorn. Wetlands disturbance is decreased by 4.3 acres. The stock pond and associated sage grouse lek on the south edge would be saved. Due to the close proximity of the heap leach, the lek and stock pond would still be indirectly impacted and the value of these sites compromised, since this alternative surrounds the pond on three sides (Figure 2.3-1). Loss of the sage grouse population would still be a potential impact. This alternative would lessen direct impacts to aquatic life associated with the pond and meadow. Therefore, this alternative would slightly lessen the overall impacts to wildlife and aquatic resources. Impacts resulting from this alternative are not considered significant. In addition, the HMMP, Appendix I, includes the creation of additional wetlands. The implementation of this Plan would render habitat impact insignificant.

4.3.4.2 Mitigation Measures for the Facilities Location Alternative 3

Soils

In regard to the impact of 11.5 additional acres of soil which supports Low Sagebrush vegetation:

- Soil salvage and reclamation will be performed in the area of additional disturbance which is based on Field Trials completed in response to the Proposed Action.

Vegetation

In regard to the impact of 11.5 additional acres of Low Sagebrush vegetation:

- Additional vegetation disturbance will be reclaimed as proposed in the Reclamation Plan for other areas of Low Sagebrush vegetation.

Wildlife and Aquatic Resources

- Mitigation for impacts to Low Sagebrush habitat and sage grouse leks would remain the same as for the Proposed Action.

4.3.4.3 Unavoidable Adverse Impacts Resulting from the Facilities Location Alternative 3

Soils

The disturbance of 11.5 acres of duripan soils would be offset by the protected land and wetlands creation in the HMMP, Appendix I. This impact is not considered significant.

Vegetation
The loss of habitat value for an additional 11.5 acres of Low Sagebrush vegetation is a long-term, significant impact. However, the implementation of the HMMP, Appendix I, would render this impact insignificant.

4.3.5 Power Supply Alternative

In the Proposed Action it is planned for SVEC to install, own, and maintain the power line to be built from Adin to the Project site. The alternative for the power supply would be for LGMI to install, own, and maintain the power line. The Power Supply Alternative would reduce the opportunity for private land owners to have public access to the new transmission line. The potential for growth-inducing impacts would be reduced because private power line owners are not obligated to provide public access to privately owned power supply facilities. After Project completion, the power line will be removed from the mine site to the intersection of County Road A2 with Highway 139. The resource areas impacted by this alternative would be air quality, socioeconomics, land use, visual and wildlife.

4.3.5.1 Impacts Caused by the Power Supply Alternative

Air Quality
The control of growth along the power line corridor would minimize the potential for impacts to air quality from wood burning in the fall and winter. This impact would not be significant.

Socioeconomics
The potential impacts due to the Power Supply Alternative would be less than the Proposed Action. The Power Supply Alternative would result in the elimination of the potential for growth and development along the power supply corridor. This reduction of impact is considered beneficial.

Land Use
The disturbed acreage from the power line installation would be the same as the Proposed Action. However, growth-inducing impacts to land use would not occur as a result of this alternative. This impact is not considered significant.

Visual Resources
The design, location, and construction of this alternative are identical to the Proposed Action and the visual impacts of the two alternatives on the power line right-of-way itself are, therefore, the same.

If this alternative is implemented, the power line will be removed from the Project site to the intersection of County Road A2 after Project completion. Although installation of a power line is within the VQOs for this area, removal would improve the visual quality of the corridor.

Wildlife and Aquatic Resources

The direct impacts to wildlife (construction and use) would be the same as the Proposed Action. The potential indirect impacts of this alternative would be less if induced growth does not occur along the corridor. The impacts would be proportional to the growth. This alternative is considered beneficial in reducing habitat impacts from induced growth.

4.3.5.2 Mitigation Measures for the Power Supply Alternative

The mitigation measures for the power supply alternative would be the same as those for the Proposed Action. The disturbed acreage would be the same, but growth-induced impacts to land use would not occur as a result of this alternative.

4.3.6 Fire Tower Alternative

Implementation of the Proposed Action will require the removal of the Hayden Hill fire lookout tower, owned by the CDFFP. The Proposed Action is to dismantle and store the fire tower on the Project site, and build a new fire lookout on Snag Hill, located nine miles west of Hayden Hill. The alternative to storing the fire tower on the Project site is to relocate it at the time of removal to the Bieber Museum. The following sections discuss this location and the other possible relocation sites. Issues, concerns and opportunities were identified during the initial stages of the draft environmental assessment preparation. These ICOs are presented below. Possible relocation sites are also listed below.

4.3.6.1 Issues, Concerns and Opportunities

Issues and concerns pertaining to the relocation of the fire tower are listed below:

1. Will the new location of the existing fire tower serve to educate and inform the public?

2. Will the new location of the existing fire tower provide for maintenance expenses?

Management objectives were developed using the issues and concerns. It was determined that the above issues are closely related. The cost to maintain the existing fire tower should be considered in the site selection. The concern is that without proper funding the tower will fall into disrepair. If a site with proper funding could not be found, the dismantled tower would have been stored at the Hayden Hill site until a suitable location could be determined.

4.3.6.2 Relocation Sites for the Fire Tower

Responses to a public notice asking for input on the relocation site identified the following alternative sites in order of popularity:

- Ash Creek Wildlife Area
- Bieber Museum
- Modoc County Fair Grounds

One additional alternative identified follows:

- USFS in Adin

Ash Creek Wildlife Area

The fire tower at this location could be used as a viewing platform for wildlife in the refuge and as an educational tool for the general public.

Concerns related to this site are the potential for security problems, and satisfying fire and safety codes. The fire code stipulates that a fire hydrant be located close enough for immediate fire protection. This would require the construction of a water line. The building has no electricity, therefore, electrical safety would not pose a problem.

Bieber Museum

This alternative would place the fire tower in the town of Bieber, approximately 16 miles northwest of the existing Hayden Hill site. Since the fire tower is historic in nature, it would be in keeping with the Museum theme. Fire safety would not pose a problem since it would be located within the Bieber Fire Protection Area.

Modoc County Fair Grounds

This alternative was suggested as an educational use for the fire tower during special occasions in the Alturas area. Fire safety would have to be considered as well as the security of the historical building during long periods when the fair grounds are not in use.

USFS in Adin

This alternative would be considered if the above alternatives were not viable due to land acquisition or due to fire and safety codes.

As of this writing, it has been decided to reconstruct the fire tower at the Bieber Museum.

4.3.6.3 Impacts Resulting from the Fire Tower Relocation

The existing fire tower will disturb approximately 5000 square feet (0.11 acres) at the relocation site chosen. Of the alternatives listed, the Ash Creek Wildlife Area is the only site in a nondeveloped area. If this area was selected the appropriate studies would have been required to determine the environmental consequences of building at this site. All of the other relocation alternative areas are developed, therefore, the environmental consequences of relocating the existing lookout at the developed sites would be minimal.

The resource areas that could be impacted by the relocation of the fire tower are vegetation, wildlife, air quality, socioeconomics, land use, cultural, visual, and recreation. These resource areas are discussed below:

Vegetation

The reconstruction of the fire tower at an undecided location will likely cause the disturbance of some vegetation, unless it is constructed in a previously disturbed area. The impact of this disturbance at the Bieber Museum would be negligible since it is a developed area.

Wildlife and Aquatic Resources

Re-construction of the fire tower would cause minor habitat disturbance and removal, which would vary with location and amount of existing disturbance. Impacts would be similar to the Proposed Action. No impact to habitat would occur at the developed, Bieber Museum site.

Air Quality

The reconstruction of the fire tower may cause impacts to air quality, however, it is unlikely any significant impacts would result from relocation to the Bieber Museum site.

Socioeconomics

The socioeconomics of the area may be impacted slightly by relocation of the existing tower. As a tourist attraction the old tower may bring people into the new relocation area. This impact is not considered significant.

Land Use

No land use impacts would result from relocation at the Bieber Museum site since that area is previously developed.

Cultural

Impacts to cultural resources at most of the sites being considered would not be significant, especially at the developed sites such as the Bieber Museum.

Visual Resources

The location chosen for relocation of the fire tower is a developed area. Impacts to visual resources would not be significant.

Recreation

Relocation of the Hayden Hill fire tower as described in Section 2.3.1.6 would result in an additional recreational resource for the entity that receives the tower (i.e. Bieber Museum). This impact is not considered significant.

4.3.6.4 Mitigation Measures for the Relocation of the Fire Tower

Mitigation would not be required for relocation of the fire tower to the Bieber Museum no significant impacts were identified to be mitigated.

4.3.7 Enclosed Cyanide System Alternatives

The Proposed Action plans to store cyanide-bearing solution for the heap leach facility in open ponds. The pregnant pond will have an operational storage capacity of 10 acre-feet, with an additional storm water storage capacity of 25 acre-feet to comply with Section 2546 of sub-chapter 15 of the California Water Regulations. The barren pond will have a storage capacity of 6.1 acre-feet.

The ponds will be fenced and covered with netting. Properly designed and maintained nets have proven to be very effective in preventing wildlife larger than the netting grid size from entering the ponds. One inch effective grid size will prevent all but the smallest of animals from passing. Netting designs have been used for many years and are being improved upon. The possibility does exist with a netting design for access to the cyanide solution by small animals, and net entanglement by small birds and bats. To minimize the possibility of avian or wildlife mortality, two alternatives to enclose the cyanide-bearing solutions are proposed, the Floating Cover Alternative, and the Process Solution Tanks Alternative. Process solutions would still be exposed at the spray and drip deployment system on the heap leach pad as they are with the Proposed Action.

4.3.7.1 Impacts Resulting from the Floating Cover Alternative

This alternative, if implemented, would require the pregnant and barren solution ponds to be covered by floating covers. Initial installation, maintenance, and replacement costs are higher for floating covers than netting. The floating cover would reduce solution evaporation and cyanide degradation which may result in some cost saving during operation of the heap facility, however, this cost saving is not significant.

Floating covers have been successfully utilized in warmer and drier regions where large amounts of snowfall are not common. However, they represent a recently developed, unproven technology, and the possibility for cover failure or damage does exist due to weather conditions at the Project site. Floating covers become more brittle in cold weather, the freezing of rain or snow into rigid sharp masses could cut the cover, and high winds can rip or pull the cover from its anchor trench. Netting is not subject to the same damaging conditions, and is easier to repair if damage occurs.

Nets are supported on cables above the surface of the pond. If a net is damaged, it is pulled off the cables, repaired and repositioned, or replaced. Floating covers must be repaired in place. The welding of very low density polyethylene (VLDPE), the current material of choice, is very sensitive to moisture, so the damaged portion of the cover would have to be elevated out of the solution and dried. This would be difficult in ponds the size of the Proposed Action, since elevating the cover out of the solution would have to be done by positioning some type of float under the damaged area. Since the liner would have to be repaired by a specialist, subject to availability, the repair could take several days. During this time wildlife would be at risk of exposure to cyanide solutions.

This alternative was evaluated for impacts and mitigation measures for the environmental resource areas, as well as risks to health and safety. The resource area affected by this alternative is wildlife. Impacts to air quality would be negligible.

Health and Safety
This alternative would be more hazardous to health and safety than the Proposed Action. During repair of damaged portions of the cover, there would be the risk that a person could slip beneath the cover and possibly drown or be poisoned. Also, the solid appearance of a floating cover would not deter animals from walking out onto the cover as netting would. If an animal acquires access past the perimeter fence and onto the cover, it would be difficult to get out. There would be risks to the safety of the persons attempting to rescue the trapped animal.

Wildlife and Aquatic Resources
Potential impacts to wildlife would vary to some degree. There would be less potential for losses to small rodents, and less potential for net entanglement by small birds and bats. This would slightly lessen the

impact to the raptor prey base. In the event of cover puncture or failure, the impacts to wildlife would be more severe than in the case of netting failure. Covered pond liners are more apt to have damage during and after severe weather events. This is the same time when wildlife, specifically water fowl, are looking for areas to rest after fighting the storm. If any wildlife larger than those which can penetrate 1 inch netting are lost during time periods such as this, the covered ponds would be more hazardous to wildlife than netting covered ponds. Netting is easier and quicker to repair and is less susceptible to damage from storm events.

The NDOW has been collecting data on wildlife mortality due to mining operations since 1986. A newsletter published in November 1990 by NDOW states, "With 95 permittees [mines] reporting to date through the third quarter of 1990, the per-mine wildlife mortality statewide continues to decline, and is at its lowest point since mortality record keeping began in 1986." (NDOW 1990). The yearly total wildlife deaths remained about the same from 1986 through 1990, while the number of mines reporting increased from 10 to 95. Preliminary data from the first and second quarters of 1991 shows over a 50 percent reduction in wildlife mortality. This is attributable to the fact that all mines had to comply with pond permit requirements, which included netting or detoxification, by last year.

The average annual mortality rate per mine in 1990 was 15. This number includes all mortalities: cyanide, non-cyanide, roadkill, passerine birds, snakes, coyotes, etc., as well as migratory birds. In discussions with NDOW personnel, it was indicated that the majority of deaths due to cyanide were due to catastrophic events involving toxic tailings (no detoxification system) and open solution ditches and ponds relying on hazing for protection (no netting). (King and Lamp 1991.) It is anticipated that the average mortality rate per mine will be even lower this year because of regulatory compliance.

The United States GAO recently published a report on Mineral Resources entitled, "Increased Attention Being Given to Cyanide Operations," (US GAO 1991). In this report, it is stated that according to USFWS and FWS and Nevada officials, "The vast majority of bird deaths occurred at the tailings ponds that attract migrating birds in arid areas where water is scarce." It is also stated in this report that "FWS surveyed 45 cyanide operations in Nevada and concluded that netting can prevent most cyanide-related bird deaths" (US GAO 1991). See Section 2.2.8.13, Sodium Cyanide, for more detail.

Potential aquatic resource impacts with the Floating Cover Alternative would be the same as the Proposed Action. Process solution systems would remain closed and separated from adjacent drainages where aquatic organisms might be impacted.

Air Quality

Hydrogen cyanide emissions resulting from the Proposed Action will not be significant. Hydrogen cyanide will evolve from all exposed surfaces of the leach solution, and the rate of evaporation is proportional to the surface area exposed. The heap leach pad encompasses the largest surface area for exposure of leach solutions to evaporation. In comparison, the process solution ponds represent a relatively minor percent of the total surface area of cyanide solution exposed for evaporation. Therefore, HCN emissions from the ponds will be minor, and the decrease in HCN emissions resulting from covering the ponds will be negligible.

4.3.7.2 Mitigation Measures for the Floating Cover Alternative

In addition to the mitigation measures required for the Proposed Action, ponding cyanide solutions would need to be siphoned or pumped off the cover before repair in the event of cover damage or failure. Also, a 24-hour watch and hazing techniques would need to be utilized to deter wildlife from entering the area during cover repair.

4.3.7.3 Unavoidable Adverse Impacts Resulting from the Floating Cover Alternative

There is an increased potential for waterfowl impact with this alternative which would be significant.

4.3.7.4 Impacts Resulting from the Process Solution Tanks Alternative

Tank System Design

This alternative, if implemented, would require process cyanide solutions to be stored in enclosed steel tanks. Steel tanks are commonly used in industries, dealing with gas, oil and chemicals, to store large amounts of toxic and hazardous solutions. The use of steel tanks to store cyanide solutions for mining operations would represent new technology for the mining industry. Only one other similar mining operation the size of Hayden Hill currently intends to use an enclosed steel tank system. This project is under construction and is not yet in production. Therefore, it is unknown whether this design will actually minimize mortality to wildlife. The following paragraphs discuss the design and sizing of a system capable of replacing the pond system proposed in the Proposed Action.

The Proposed Action design uses ponds that are below grade so that solution flow is by gravity into the ponds. Solution is pumped from the ponds by pumps in stand pipes connected to the ponds. This design makes effective use of the topography and minimizes the number of pumps required to move solution. Additional pumps would require more energy consumption, would have to be oversized to handle storm events as well as process flow variations, and the additional pumps and pipe would represent an increased spill potential. A pump failure or power loss could result in solution flow to the event pond, especially if it occurs during a period of freezing temperatures. Therefore, the tanks would require placement below grade to maintain the gravity flow of solutions. The tanks would be free standing in an excavated area (Figure 2.3-2). Buried tanks have a higher probability of undetected leakage than do free-standing tanks.

The size and amount of tanks required for the heap leach operation is a function of the operation plan and procedures of the entire system. The tanks must be appropriately sized for application and return rates. The balance between tank levels must be properly maintained. The tanks are generally sized to store the total amount of solutions from process-related operational surges, the total amount of water generated as a result of typical storm events, and the solution from the heap during unexpected shutdowns. The tank storage system would have to be provided with a storm event pond capable of handling the solution surges generated as a result of less frequent heavy hydrologic events. A proposed design using eleven approximately 500,000 gallon tanks in conjunction with a 25 acre-foot event pond, sized for a 1,000-year, 24-hour storm event to hold precipitation run-off from the heap during storm events, was considered.

Figure 2.3-2 is a drawing of one of the twelve tanks systems required for this proposed design. The top of the tanks are about five feet below grade to allow gravity solution flow from the heap leach collection ditch into the tank. The event pond (storm water storage) must be below the bottom of the tanks so the tanks would not float and tear the liner system if the storm event is realized. Therefore, the additional excavation required for this alternative would require approximately 1.0 more acre of disturbance than the Proposed Action.

Since the purpose of this alternative is to minimize wildlife mortality by enclosing the process cyanide solutions, the event pond would require a wildlife protection system of netting or a floating cover, similar to the Floating Cover Alternative discussed above.

A smaller system of only one tank would not be feasible. One empty 500,000 gallon tank would be capable of handling only 4.2 hours of operational surges, and hydrological events of 0.25 inches of rainfall in an hour which corresponds to seasonal storm events in the area. Therefore, it would be expected that the solution surges would overflow the tank and introduce solution into the storm event pond on a relatively frequent basis resulting in the same wildlife exposure as with the proposed action. As discussed in Section 4.3.7.1, this would not accomplish the purpose of the alternative which is to reduce wildlife mortalities.

To minimize solution in the storm event pond, additional tanks would be required. Seven additional steel tanks, 75-feet in diameter by 15-feet high would be necessary to hold the entire 10 acre-feet of pregnant pond operation storage. In addition, extra tanks would be required to hold the barren pond solution. The number of tanks required would depend on the mill and heap leach operation plan. However, to handle the 6.1 acre-feet barren pond, four additional tanks would be required. The additional tank systems would require additional excavation and disturbance. Eleven tanks and their containment pond would require approximately 2.5 more acres of disturbance than the Proposed Action.

The Nevada Department of Wildlife indicated that of 95 operating mines, one mine which began production last fall is using open-topped steel tanks. The environmental coordinator for the operation said the system seems to be working fairly well and no major problems have occurred so far with operation or use (McPherson 1991). The mine is much smaller than the proposed Project. It is a heap leach only operation. At this time they are using three 30,000 gallon open topped tanks for their barren and pregnant solutions to spray a 23-acre heap. Freezing was not a problem in the first year because with only three small tanks it is less difficult to keep solutions constantly circulating through the system. The tanks are on a sloped concrete pad that flows into a lined overflow sump. The sump is not netted. This operation decided on tanks based on feasibility, site constraints, economics, evaporation and water supply, and gained some benefits in wildlife protection.

As indicated by the tank design discussion for Hayden Hill, 11 tanks, each able to contain approximately 500,000 gallons, would be required to operate both the 199-acre heap and mill. This would be considered a large tank farm compared to the smaller operation discussed above. The tank levels and balances must be properly maintained. The more tanks required, the more difficult to operate and monitor them efficiently. Also it would be more difficult to protect the solution in pipes and tanks from freezing. If a power failure, or pump failure occurred during the winter any time after the Project went into operation, pipes could freeze and allow flows into the containment ponds. If this were to occur, or if for any other reason solutions would enter the event ponds, including unexpectedly high storm events, this alternative would not prevent wildlife mortality to a higher degree than the Proposed Action.

Impacts

Impacts and mitigation measures resulting from this alternative were evaluated for the environmental resource areas. Capital costs and health and safety risks were also evaluated. Those resource areas impacted by this alternative are soils, vegetation, wildlife and visual resources. Effects to air quality would not be significant.

Health and Safety

An additional safety hazard introduced by this alternative would be the possibility of concentrated HCN vapor in the enclosed tanks which could endanger workers entering the tank if adequate personnel safety equipment is not used when repair or maintenance is required. Procedures for this type of tank repair are readily available and required by regulating agencies. Procedures for this type of tank repair are readily available and required by regulating agencies.

Project Economics

Steel tanks would significantly increase the capital cost of the Project. This alternative would require additional materials, tank erection costs, a tank anchoring system, and excavation over the Proposed Action. The entire excavation must be lined to prevent leakage of solutions, requiring more material and installation costs. The additional cost required for this alternative is estimated to be $ 432,700 for a one tank operation to $3,559,700 for the addition of seven pregnant pond and four barren pond tanks.

The tank system would reduce solution evaporation and cyanide degradation which would result in investment returns during the life of the heap leach operation. The savings from these sources are not considered significant.

Soil

An additional 2.5 acres of duripan soils would be removed under this alternative. This impact is not considered significant.

Vegetation

Approximately 2.5 additional acres of Low Sagebrush vegetation and associated habitat would be impacted if this alternative were implemented. The cover value of this lost vegetation would be replaced by reclamation. However, the habitat value would not return due to the loss of the duripan soil associated with this vegetation type. These impacts are not considered significant. Implementation of the HMMP, Appendix I, would help reduce this impact.

Wildlife and Aquatic Resources

Potential impacts to wildlife would not diminish to any significant degree. There would be less potential for losses to small rodents and less potential for net entanglement by small birds and bats, slightly decreasing the impact to the raptor prey base. In the event of tank leakage or overflow, cyanide solutions would flow into the overflow pond (the storm event pond). If the pond were not covered, wildlife mortalities would occur to a level exceeding the Proposed Action. Depending on the season and amount of solution in the pond, the result could be catastrophic. If the overflow ponds were covered with netting, the impacts to wildlife would be the same as the Proposed Action. Netting when properly installed and maintained is very effective in keeping mortality levels low. If the pond were covered with a solid liner, the impacts would resemble those in the Floating Cover Alternative, and would not be superior to the Proposed Action in preventing wildlife mortality.

The NDOW has been collecting data on wildlife mortality due to mining operations since 1986. A newsletter published in November 1990 by NDOW states, "With 95 permittees [mines] reporting to date through the third quarter of 1990, the per-mine wildlife mortality statewide continues to decline, and is at its lowest point since mortality record keeping began in 1986." (NDOW 1990). The yearly total wildlife deaths remained about the same from 1986 through 1990, while the number of mines reporting increased from 10 to 95. Preliminary data from the first and second quarters of 1991 shows over a 50 percent reduction in wildlife mortality. This is attributable to the fact that all mines had to comply with pond permit requirements, which included netting or detoxification, by last year.

The average annual mortality rate per mine in 1990 was 15. This number includes all mortalities: cyanide, non-cyanide, roadkill, passerine birds, snakes, coyotes, etc., as well as migratory birds. In discussions with NDOW personnel, it was indicated that the majority of deaths due to cyanide were due to catastrophic events involving toxic tailings (no detoxification system) and open solution ditches and ponds relying on hazing for protection (no netting) (King and Lamp 1991). It is anticipated that the average mortality rate per mine will be even lower this year because of regulatory compliance.

The United States GAO recently published a report on Mineral Resources entitled, "Increased Attention Being Given to Cyanide Operations," (US GAO 1991). In this report, it is stated that according to USFWS and FWS and Nevada officials, "The vast majority of bird deaths occurred at the tailings ponds that attract migrating birds in arid areas where water is scarce." It is also stated in this report that "FWS surveyed 45 cyanide operations in Nevada and concluded that netting can prevent most cyanide-related bird deaths" (US GAO 1991). See Section 2.2.8.13, Sodium Cyanide, for more detail.

With the evidence provided by NDOW and the findings reported in the GAO report, that properly installed and maintained netting is very effective in deterring birds (especially the smaller grid size netting), the minor benefits to wildlife protection gained by solution tanks do not outweigh the detrimental operational, visual economic and disturbance (soils, vegetation and habitat) impacts.

Potential aquatic resource impacts with the enclosed cyanide system alternatives (covering or placing process solutions in tanks) would be the same as the Proposed Action. Process solution systems would remain closed and separated from adjacent drainages where aquatic organisms might be impacted. Approximately 2.5 acres of Low Sagebrush habitat would be lost if this alternative were implemented. This impact is not considered significant.

Air Quality

Hydrogen cyanide emissions resulting from the Proposed Action will not be significant. Hydrogen cyanide will evolve from all exposed surfaces of the leach solution, and the rate of evaporation is proportional to the surface area exposed. The heap leach pad encompasses the largest surface area for exposure of leach solutions to evaporation. In comparison, the process solution ponds represent a relatively minor percent of the total surface area of cyanide solution exposed for evaporation. Therefore, HCN emissions from the ponds will be minor, and the decrease in HCN emissions resulting from storing the process solutions in tanks will be negligible.

Visual Resources

There will be no views of this alternative from Highway 139. There will be views of the enclosures (tanks) from the secondary roads south and west of the Project area, resulting in a higher visual impact than the Proposed Action. The size and material of the structures would contrast with the surrounding area and impact views from these roads throughout the life of the Project. This impact is not considered significant.

4.3.7.5 Mitigation Measures for the Process Solution Tanks Alternative

The mitigation measures for the Process Solution Tanks Alternative would be the same as those for the Proposed Action other than those described below:

Tank System Design

- All piping, which could possibly experience leaks will be place within the lined event pond or within ditches which drain to this event pond.
- The event ponds will be covered with netting instead of solid covers.

Health and Safety

- All regulatory controls for safe work practices will be followed during repair, maintenance and operation of the tank facilities.

Vegetation

- The HMMP, Appendix I, will be implemented to offset impacts to Low Sagebrush vegetation.

Wildlife and Aquatic Resources

- In the event of tank system failure, the overflow pond, if not netted, would have to be neutralized, 24-hour watch posted, and hazing techniques utilized.
- The HMMP, Appendix I, will be implemented to reduce wildlife impacts.
- The event ponds will be netted rather than covered with floating covers.

Visual Resources

- Mitigation for the Process Solution Tanks Alternative will include painting any structures with colors that blend with (not contrast) the existing environment.

4.3.7.6 Unavoidable Adverse Impacts Resulting from the Process Solution Tanks Alternative

The additional loss of 2.5 acres of habitat value associated with the Low Sagebrush vegetation will be a long-term unavoidable adverse impact. Due to the small amount of disturbance compared to the Proposed Action, this impact is not considered significant. The size and materials of the tanks would visually contrast with the surrounding area during mine life. This impact is considered short-term and not significant.

4.4 Other Required Considerations

This section focuses on several specific impacts of the Proposed Action as required by NEPA and CEQA. These issues are:

- Relationship Between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity
- Irreversible and Irretrievable Commitment of Resources
- Growth-Inducing Effects of the Proposed Action
- Energy Consumption and Conservation

Most of the information presented here is based upon more detailed discussions in previous portions of this document.

4.4.1 Relationship Between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Current land uses at the Project site include livestock grazing, timber production, wildlife habitat, watershed, recreation, agricultural preserve, and minerals exploration. All of these land uses will be maintained after the completion of reclamation, except for timber production and agricultural preserve. The Project would commit approximately 1500 acres of the 2,822 acre site to a single land use, minerals extraction, for a short-term period of approximately eight years. The remainder of the site would not be fenced and would continue to be available for grazing, wildlife habitat, watershed, and recreation. The Hayden Hill recreational opportunities would be enhanced by the development of a viewing site with signs and exhibits that describe the historic mining district and current mining activities to visitors to the area. When the fire tower Alternative is implemented, the existing fire lookout tower would be relocated to the Bieber Museum, creating a recreational resource in the new location.

Post-mining reclamation will restore the majority of the site and most of the existing land uses will be reestablished. The steeper portions of the pit and pit highwalls, covering approximately 54 acres will not be reclaimed, and would not be available for grazing. The pit highwalls, however, will provide habitat for raptors, and the flatter portions of the pit will be available for wildlife. The Backfilled Pit Alternatives would provide slightly more reclaimed area and corresponding habitat in the bottom of the pit, however, the highwalls may no longer be available for raptor habitat if the Comprehensive Backfilled

Pit Alternative were implemented. Facilities Location Alternative 3, if implemented, would disturb slightly less riparian habitat than the Proposed Action.

The mine pit and the surrounding area would remain accessible for future mineral exploration and production. However, significant portions of the pit walls would be covered if the Pit Backfilling Alternatives were implemented. Reclamation procedures for the pit include the stabilization of the pit highwalls to reduce potential risks to health and safety.

Range will be temporarily impacted by the Project. Reclamation is expected to successfully return site productivity for grazing, thereby reestablishing this land use.

Facilities have been designed to minimize disruption to surface water drainages and to avoid overflow discharges. An erosion control plan to control temporary sedimentation of the streams will be implemented. The additional benches on the waste rock dump, required by the Complete Benching Alternative, would decrease the potential for the introduction of sediment to the Preston Canyon drainage. Even so, the watershed is not expected to be adversely affected by the Proposed Action.

Reclamation of the Jeffrey Pine/Mountain Shrub and the Low Sagebrush vegetation types for commercial timber and wildlife use, respectively, is unlikely. The agricultural preserve lands will require reclassification if the County determines that mining uses are not compatible with the uses of these lands.

The Proposed Action would minimize potential environmental impacts while providing economic and social benefits to Lassen County. Project employment, induced jobs, indirect expenditures, and property, sales, and use taxes would contribute to the economic health of the region. Development of mineral resources is in the national interest for industrial and personal needs. In providing these benefits, the Project would not preclude the long-term use of the site for other principal uses.

4.4.2 Irreversible and Irretrievable Commitment of Resources

The irreversible and irretrievable commitment of resources would include the consumption of nonrenewable energy or materials, such as gasoline, and actions resulting in permanent consequences. An example of a permanent consequence would be the removal of a mountain top by an open pit mine.

The mining of the Hayden Hill ore body would be an irretrievable use of a precious metals reserve. However, the extraction and processing of the metals would make the resources available for use by society.

The irretrievable commitment of resources during construction and operations would involve the use of energy and materials. Energy resources consumed would include propane, diesel fuel, electricity, gasoline and oil. Materials used for construction would include wood, aggregate, plastics, steel, aluminum, and other metals. Materials and resources used during operations include reagents, explosives, lime, chemicals, water, and rubber. The Comprehensive Backfilled Pit and Smoothed Waste Rock Dump Alternatives, if implemented, would increase mine life by approximately four years and one to two years, respectively, increasing the consumption of these resources. The Floating Cover and Process Solution Tanks Enclosed Cyanide System Alternatives would require the additional consumption of rubber and steel, respectively. It is possible, upon Project completion, that equipment, processing facilities and structures will be removed from the site for use in other locations.

Changes in the topography as a result of the Proposed Action will be permanent, thus impacting visual resources. Although most of these changes will blend with the landscape upon successful completion of reclamation, the pit highwalls will remain apparent in the landscape. The benches of the Smoothed Waste Rock Dump Alternative, if implemented, would be eliminated, resulting in a more natural-appearing landform from Highway 139.

The construction of the power line, and the resulting availability of electricity, would cause an indirect, irreversible inducement for commitment to development along Highway 139. If the Power Supply Alternative were implemented, LGMI would own most of the power line, precluding the availability of electricity for development.

A portion of *Antennaria flagellaris*, representing 20 percent of the presently known population of this special status species in the State of California, may be lost. An environmental accident or spill of fuels, reagents, or chemicals could impact water resources and ultimately harm the Modoc sucker, a Federally listed endangered species, which may be present in Willow Creek. Project noise will be perceptible in this very quiet area.

The storage and use of toxic and hazardous materials used by the Project will meet all pertinent Federal, State, and County regulations. A SPCC and ERP Plan has been developed to address mitigation of potential spills, and covers toxic and hazardous materials stored, used, transported to and transported from the Hayden Hill site. A Draft Hazardous Materials Incident and Contingency Plan has also been developed which outlines the procedures to be followed in the event of an accident or spill during transportation of hazardous materials on Lassen County highways.

4.4.3 Growth-Inducing Effects of the Proposed Action

It is estimated that the Hayden Hill Project will generate a population increase of 236 persons in the Susanville and Bieber areas of Lassen County, and in the Alturas and Adin areas of Modoc County. The increase in population will cause fiscal operating deficits in the school districts. Modoc County will not receive property tax revenues from the Project. This will result in fiscal deficits.

The population increase would result in the formation of induced jobs and purchases of local goods and services. Significant revenues would be generated by the Project-direct property taxes for the Lassen County government and schools. Project-direct sales and use taxes will benefit the cities and government of Lassen County. Housing purchased by Project-related households will generate additional property tax revenues, and will benefit both Lassen and Modoc counties. Housing construction and additional water consumption induced by Project-related employees would result in the loss of fish and wildlife habitats.

The Comprehensive Backfilled Pit and Smoothed Waste Rock Dump Alternatives would increase mine life by approximately four years and one to two years, respectively. Deficits and revenues would continue for these additional time periods if the alternatives were implemented.

The construction of the power line along Highway 139 from Adin to Hayden Hill Road could cause development in areas that previously did not have access to electricity. Studies show that 182 residential units could be built resulting in a potential of an induced population increase of 450 to 550 persons. This development would result in corresponding increases in many County services, with associated increases in local government operating costs. In addition, fish and wildlife habitat would be lost to this new development by land development and water consumption.

Positive and negative growth-induced impacts resulting from power line development would not occur if the Power Supply Alternative were implemented. This alternative would require that the power line be installed, owned, and maintained by LGMI.

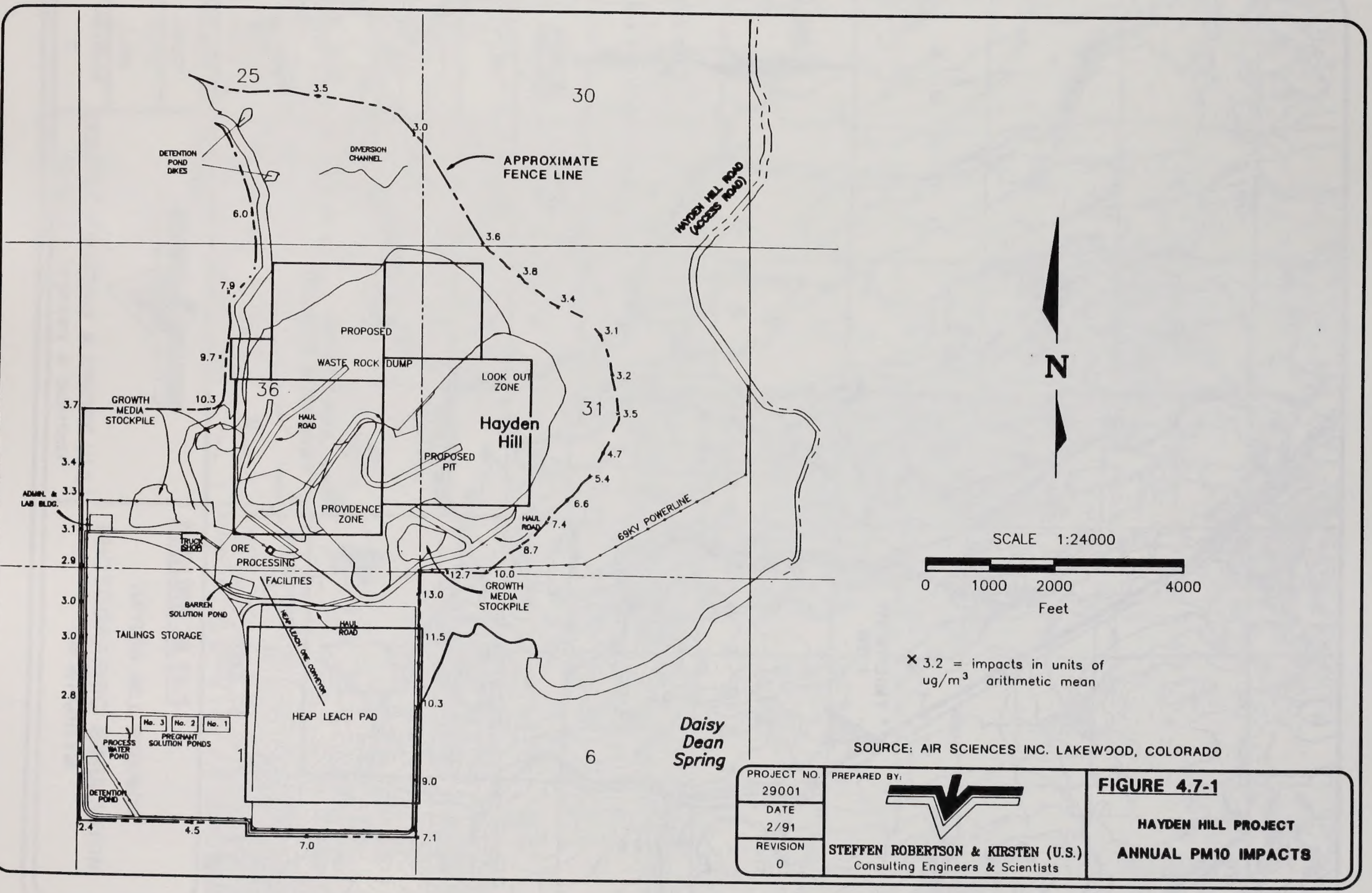
4.4.4 Energy Consumption and Conservation

The principal non-renewable energy requirements for the Hayden Hill Project will be fuel for mining equipment and motor vehicles, and for processing of the ore. Annual energy consumption for the approximately eight year mine life is estimated to be 2.6 million gallons of diesel fuel, 617,000 gallons of propane, and 115,500 gallons of gasoline.

Electrical power for all the Project facilities and water supply pumps will be provided by a three-phase 69 KV overhead transmission line. The power demands for the Project are estimated to be 9,500 KW, connected load. Annual electrical consumption is estimated to be 79,054,000 kilowatt (KW) hours.

The Comprehensive Backfilled Pit and Smoothed Waste Rock Dump Alternatives, if implemented, would increase mine life by approximately four years and one to two years, respectively, increasing the consumption of these resources.

Fuel consumption by the mobile mining equipment would be the largest single energy requirement of non-renewable energy products. A regular maintenance program for all vehicles and mining equipment will be the primary opportunity for energy conservation. In addition, the Project facilities and haul roads were designed for operational efficiency to reduce haul distances and fuel consumption. During the construction and operating phase, company employees will be transported to the mine in company car pool vehicles to reduce traffic volume and conserve energy.


25
3.5
30
3.0
DETENTION POND DIKES
DIVERSION CHANNEL
APPROXIMATE FENCE LINE
HAYDEN HILL ROAD (ACCESS ROAD)
6.0
3.6
3.8
3.4
7.9
PROPOSED
WASTE ROCK DUMP
3.1
9.7
3.2
LOOK OUT ZONE
Hayden Hill
31
3.5
N
36
10.3
3.7
GROWTH MEDIA STOCKPILE
HAUL ROAD
PROPOSED PIT
4.7
5.4
3.4
3.3
ADMIN. & LAB BLDG.
PROVIDENCE ZONE
6.6
HAUL ROAD
7.4
69KV POWERLINE
3.1
TRUCK SHOP
ORE PROCESSING FACILITIES
8.7
SCALE 1:24000
2.9
12.7
10.0
0
1000
2000
4000
Feet
GROWTH MEDIA STOCKPILE
3.0
BARREN SOLUTION POND
13.0
HAUL ROAD
3.0
TAILINGS STORAGE
HEAP LEACH ORE CONVEYOR
11.5
× 3.2 = impacts in units of ug/m3 arithmetic mean
2.8
10.3
HEAP LEACH PAD
Daisy Dean Spring
No. 3
No. 2
No. 1
PREGNANT SOLUTION PONDS
PROCESS WATER POND
1
6
DETENTION POND
9.0
2.4
4.5
7.0
7.1

SOURCE: AIR SCIENCES INC. LAKEWOOD, COLORADO

PROJECT NO.	PREPARED BY:	**FIGURE 4.7-1**
29001		
DATE		**HAYDEN HILL PROJECT**
2/91		
REVISION	**STEFFEN ROBERTSON & KIRSTEN (U.S.)**	**ANNUAL PM10 IMPACTS**
0	Consulting Engineers & Scientists	

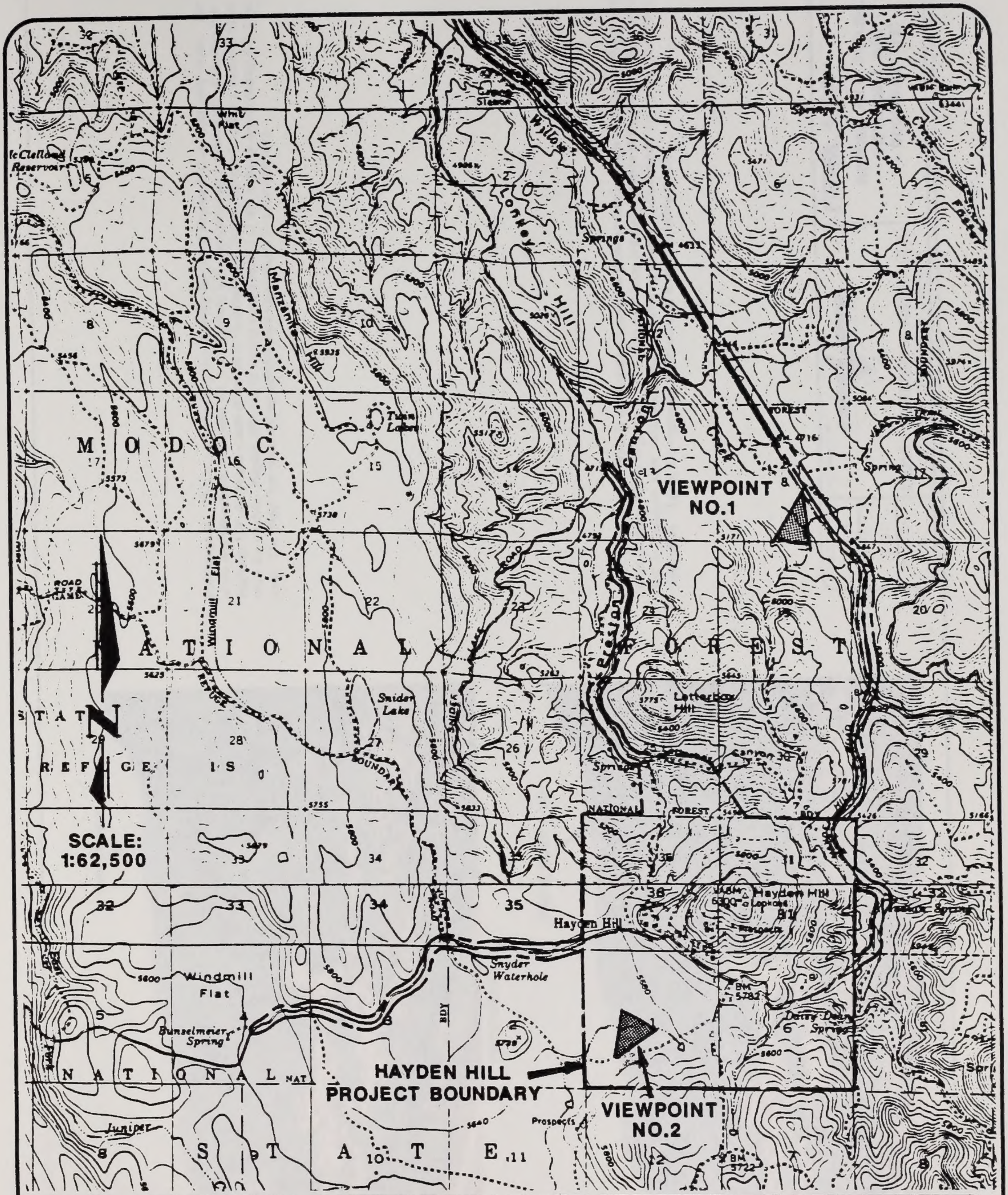

VIEWPOINT NO.1
VIEWPOINT NO.2
HAYDEN HILL PROJECT BOUNDARY
SCALE: 1:62,500
N
MODOC
NATIONAL
FOREST
STATE
REFUGE
NATIONAL
STATE
Hayden Hill
Letterbox Hill
Snider Lake
Twin Lakes
Snyder Waterhole
Windmill Flat
Bunselmeier Spring
Juniper
Manzanita Hill
Donkey Hill
Willow
Canyon
Springs
Spring
Prospects
McClelland Reservoir
Daisy Dean Spring

FIGURE 4.11-1

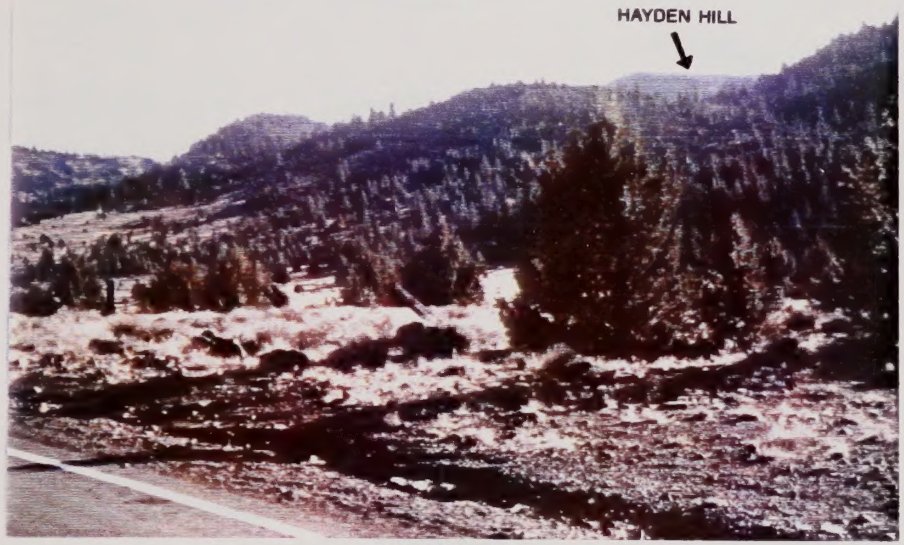
HAYDEN HILL PROJECT

PHOTOGRAPHIC SIMULATION VIEWPOINTS

PROJECT NO.	29001
DATE	3/91
REVISION	0

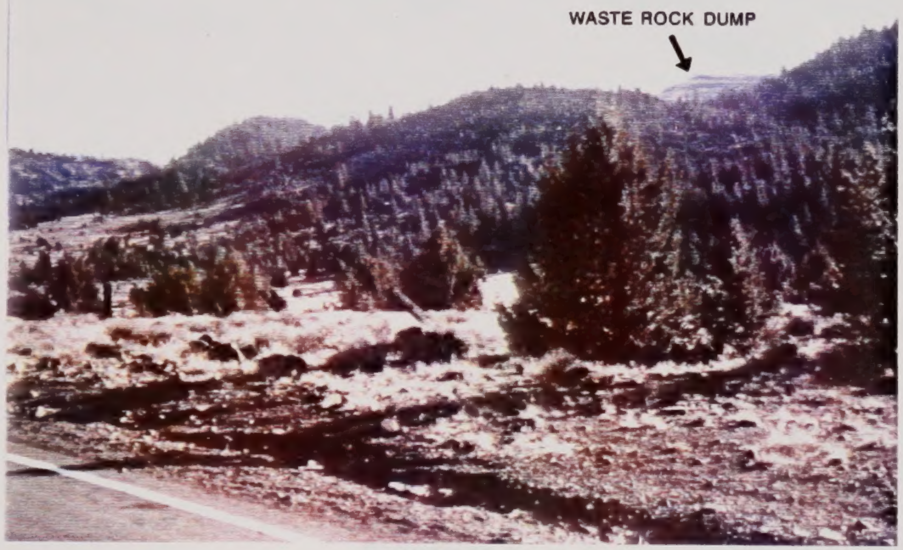
PREPARED BY:

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists



PHOTOGRAPH A

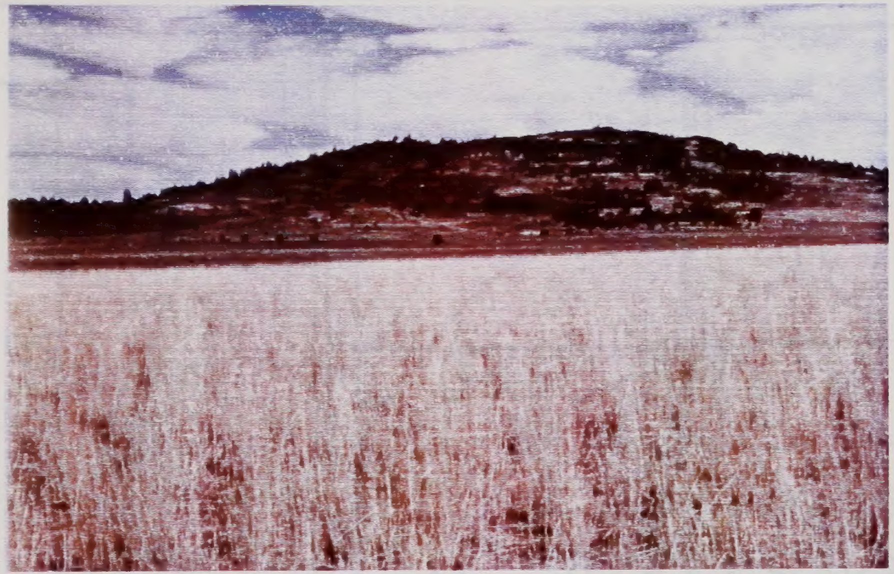
Photograph A: **This is a pre-mining photo showing the top of Hayden Hill** as it presently exists. The photo was **taken from Viewpoint No. 1 on Highway 139, approximately 3 miles north of Hayden Hill.** Highway 139, the primary area of influence, is classified as "scenic highway" and is a common travel route for tourists. **Hayden Hill can be viewed from a section of this highway approximately** 0.7 miles long. **The photo was taken during autumn when vegetation is in a dormant state.**



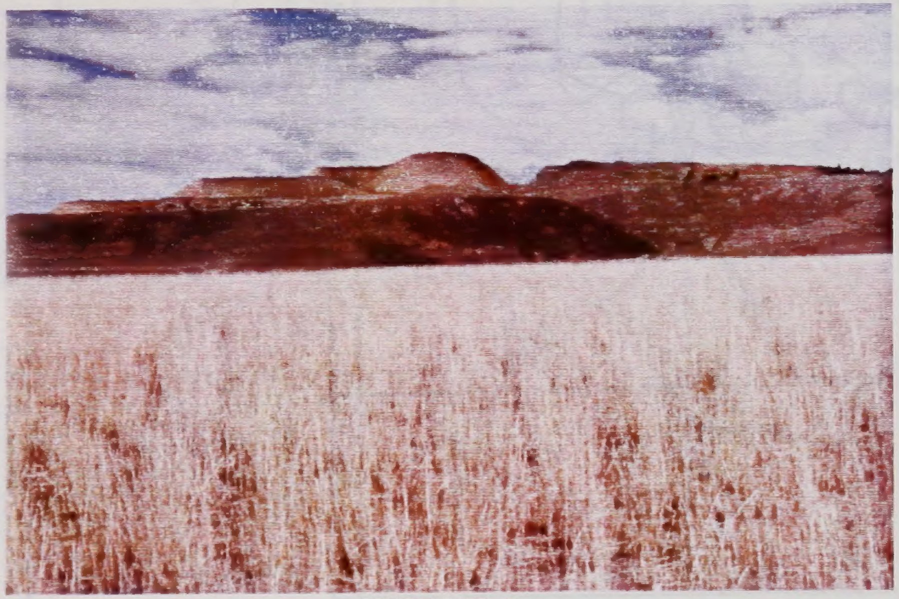
PHOTOGRAPH B

Photograph B: **This photo is a post-mining simulation showing the same view of the top of Hayden Hill** from Highway 139 as in photo A. The waste rock dump is the only portion of the Project that is visible, and is displayed after reclamation and one growing season, approximately two years after mining completion. Again, the vegetation is presented as it appears during autumn.

PROJECT NO. 29001	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	**FIGURE 4.11-2** **HAYDEN HILL PROJECT** **VIEWPOINT NO. 1** **(HIGHWAY 139)**
DATE 3/91		
REVISION 0		



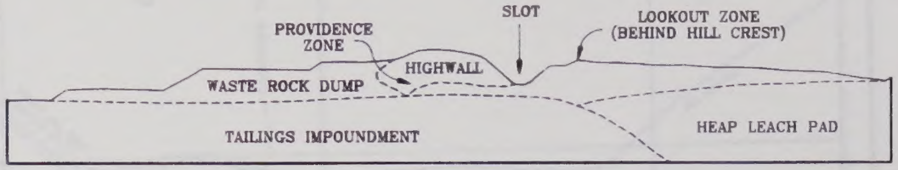
PHOTOGRAPH C



PHOTOGRAPH D

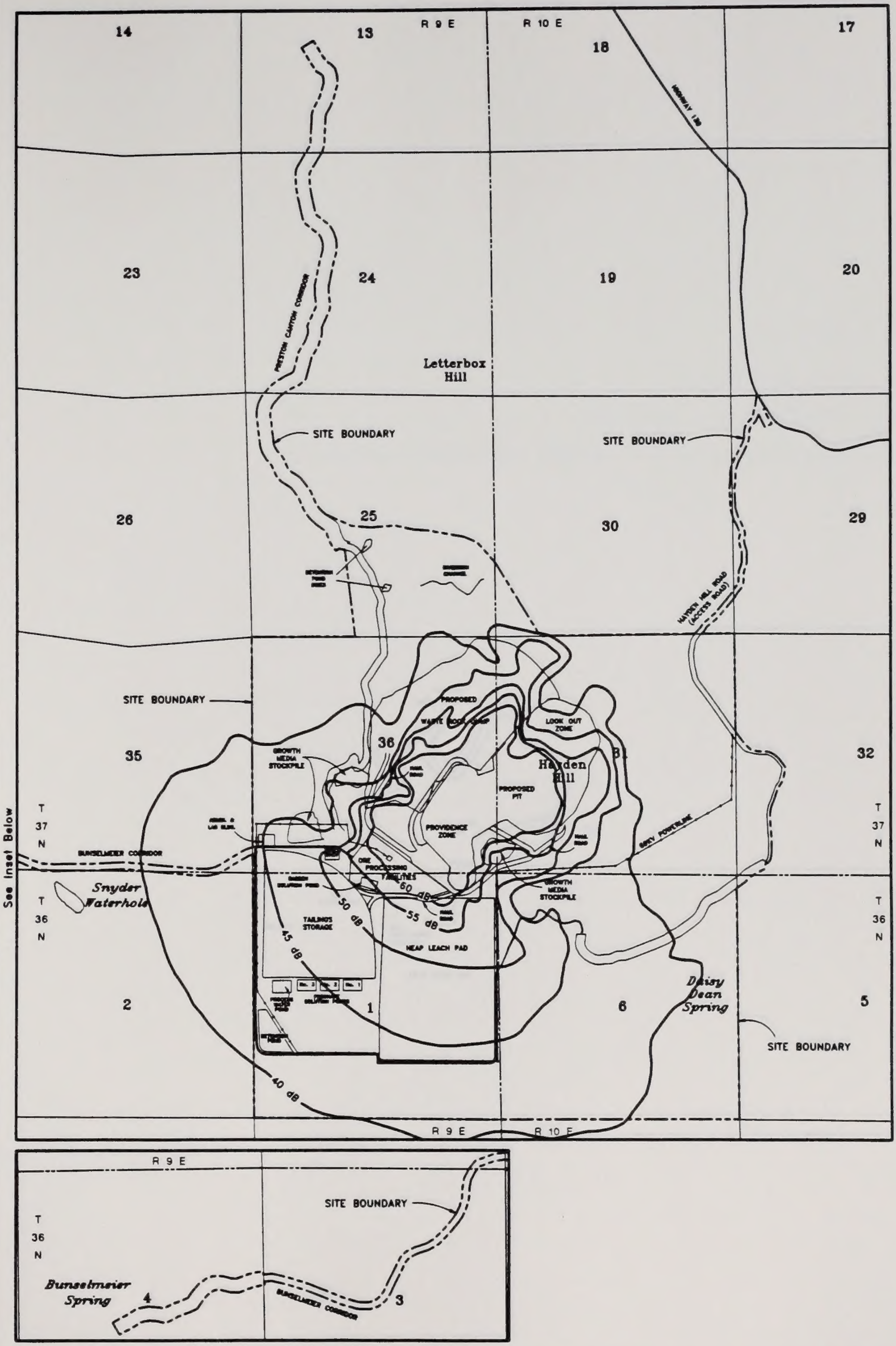
Photograph C: This is a pre-mining photo of the Project site as seen from Viewpoint No. 2, near an unimproved road to the southwest. Views from the unimproved roads south and west of the Project site are less of a concern than those from Highway 139 because of the minimal and almost exclusive use of these roads by the USFS, BLM, and occasional hunters. The photo was taken during autumn when vegetation is in a dormant state.

Photograph D: This photo is a post-mining simulation showing the same view of the Project site from Viewpoint No. 2. The pit, waste rock dump, tailings impoundment, and heap leach pad are displayed as they would appear after reclamation and one growing season, approximately two years after mining completion. Vegetation in the pit area is simulated to show a greater amount of natural invasion on the upper benches and slopes completed earlier in the mining process than those completed later in the lower pit areas. Again, the vegetation is presented as it appears during autumn.

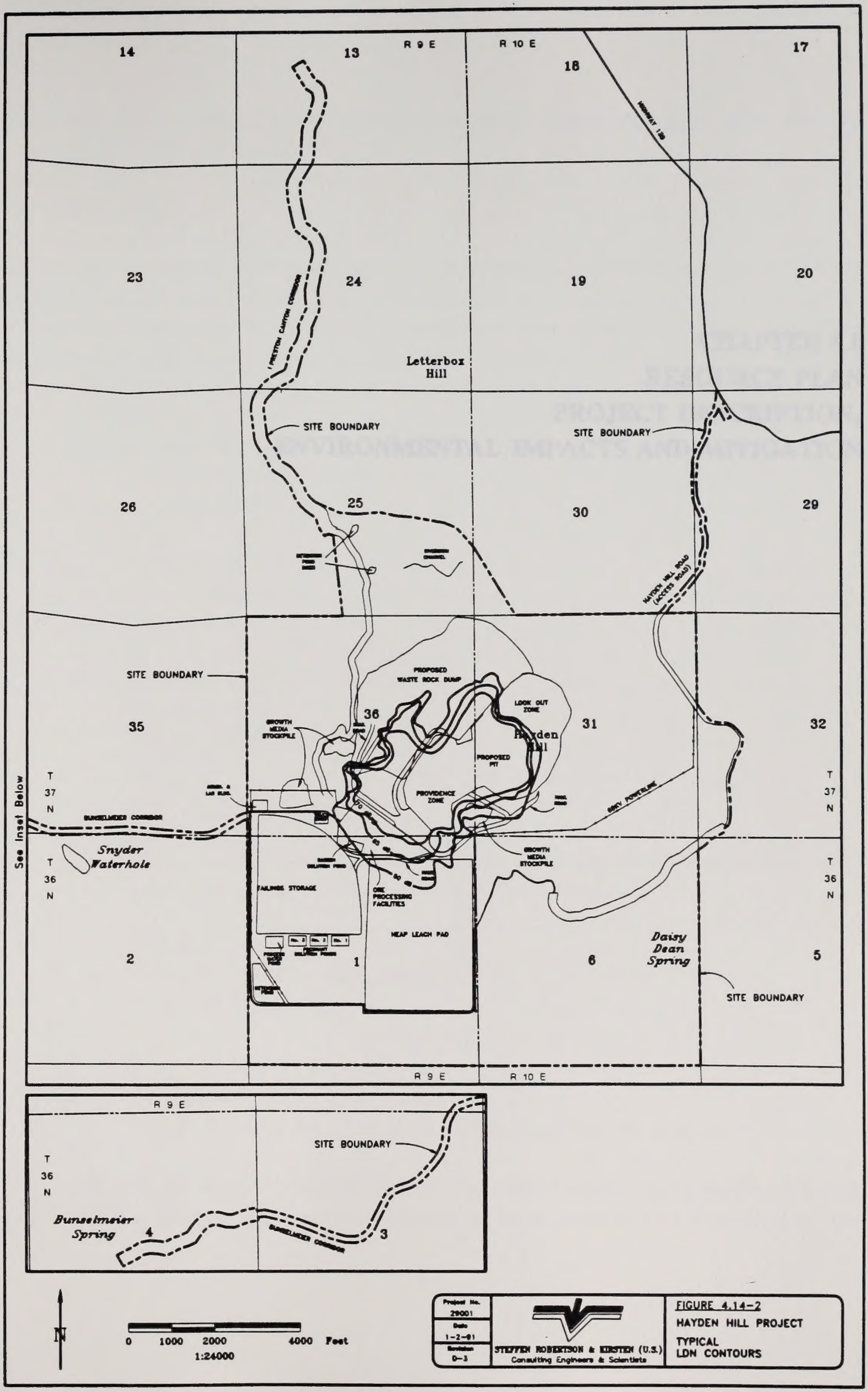


SCHEMATIC OF PHOTOGRAPH D

PROJECT NO. 29001	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	**FIGURE 4.11-3** **HAYDEN HILL PROJECT VIEWPOINT NO. 2 (SOUTHWEST OF PROJECT AREA)**
DATE 3/91		
REVISION 0		


14
13
R 9 E
R 10 E
18
17
HIGHWAY 139
PRESTON CANYON CORRIDOR
23
24
19
20
Letterbox Hill
SITE BOUNDARY
SITE BOUNDARY
26
25
30
29
HAYDEN HILL ROAD (ACCESS ROAD)
SITE BOUNDARY
PROPOSED
WASTE ROCK DUMP
LOOK OUT ZONE
36
35
31
32
GROWTH MEDIA STOCKPILE
Hayden Hill
HAUL ROAD
PROPOSED PIT
PROVIDENCE ZONE
ADMIN. & LAB BLDG.
SMUD POWERLINE
T 37 N
T 37 N
BUNSELMEIER CORRIDOR
ORE PROCESSING FACILITIES
See Inset Below
Snyder Waterhole
60 dB
GROWTH MEDIA STOCKPILE
T 36 N
T 36 N
50 dB
55 dB
HAUL ROAD
TAILINGS STORAGE
45 dB
HEAP LEACH PAD
Daisy Dean Spring
2
1
6
5
SITE BOUNDARY
40 dB
R 9 E
R 10 E
R 9 E
SITE BOUNDARY
T 36 N
Bunselmeier Spring
4
BUNSELMEIER CORRIDOR
3
N
0
1000
2000
4000
Feet
1:24000

Project No.	STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists	FIGURE 4.14-1
29001		HAYDEN HILL PROJECT
Date 11-14-90		TYPICAL HOURLY LEQ CONTOURS
Revision 0-3		


14
13
R 9 E
R 10 E
18
17
HIGHWAY 139
23
24
19
20
PRESTON CANYON CORRIDOR
Letterbox Hill
SITE BOUNDARY
SITE BOUNDARY
26
25
30
29
DIVERSION CHANNEL
HAYDEN HILL ROAD (ACCESS ROAD)
SITE BOUNDARY
PROPOSED WASTE ROCK DUMP
LOOK OUT ZONE
35
36
31
32
GROWTH MEDIA STOCKPILE
Hayden Hill
PROPOSED PIT
PROVIDENCE ZONE
HAUL ROAD
69KV POWERLINE
T 37 N
BUNSELMEIER CORRIDOR
70
65
60
Snyder Waterhole
GROWTH MEDIA STOCKPILE
T 36 N
TAILINGS STORAGE
ORE PROCESSING FACILITIES
HEAP LEACH PAD
No. 3
No. 2
No. 1
PREGNANT SOLUTION PONDS
PROCESS WATER POND
2
1
6
Daisy Dean Spring
5
SITE BOUNDARY
R 9 E
R 10 E
See Inset Below
R 9 E
SITE BOUNDARY
T 36 N
Bunselmeier Spring
4
BUNSELMEIER CORRIDOR
3
N
0 1000 2000 4000 Feet
1:24000
Project No. 29001
Date 1-2-91
Revision D-3

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

FIGURE 4.14-2
HAYDEN HILL PROJECT
TYPICAL
LDN CONTOURS

CHAPTER 5.0
RESOURCE PLAN
PROJECT DESCRIPTION,
ENVIRONMENTAL IMPACTS AND MITIGATION

5.0 PROJECT DESCRIPTION, ENVIRONMENTAL IMPACTS AND MITIGATION HAYDEN HILL RESOURCE PLAN

5.1 Introduction

It is recommended that the reader obtain a copy of the Draft Hayden Hill Resource Plan to review in conjunction with this section of the EIR/EIS, which assesses environmental impacts of the Resource Plan. Although this section summarizes the contents of the Resource Plan, it is important to have the complete text of the goals, policies and objectives to understand the changes to the text proposed in the mitigation section. The Hayden Hill Resource Plan is available for review at:

1. Lassen County Planning Department
   707 Nevada Street Room 236
   Susanville, California 96130

   (916) 257-8311 ext. 271

   Hours: Call for office hours

2. Lassen County Free Library
   Courthouse Annex
   Susanville, California 96130

   (916) 257-8311 ext. 127

   Hours: Tuesday and Wednesday, 10:00 am to 7:00 pm, Thursday and Saturday 10:00 am to 5:00 pm. Closed Mondays, Fridays and Sundays

3. Bieber Library
   Bieber Memorial Hall, Bridge Street
   Bieber, California 96009

   (916) 294-5505

   Hours: Tuesdays only, 12:00 pm to 5:00 pm, and 6:00 pm to 8:00 pm

This section of the EIR describes the proposed Draft Hayden Hill Resource Plan in summary form and identifies the potential impacts and mitigation measures for implementation of the Resource Plan. The impacts and mitigation for the Resource Plan are separate from the environmental consequences of the proposed Project described in Chapter 4.0. The Resource Plan mitigation measures apply only to the Plan. They do not apply to the proposed Project. Since the Resource Plan is a Lassen County policy document, implementation of mitigation for the Resource Plan is the responsibility of the County.

5.2 Project Description–Hayden Hill Resource Plan

5.2.1 Purpose of the Resource Plan

Extraction of mineral resources is essential to the needs of society and contributes to the economic base of Lassen County. Historically, Hayden Hill has been the site of mining and exploration of gold and precious metals since 1869. Gold mining continued into the 1900s. The Hayden Hill Resource Plan was developed to respond to the interest expressed by the mining industry to extract gold and silver from Hayden Hill.

The Resource Plan is an amendment to the General Plan which was prepared for Lassen County to provide updated guidelines for development of mineral resources at Hayden Hill. The Resource Plan contains goals, policies and objectives specifically for development of mineral resources at Hayden Hill within the overall goals of the General Plan. The General Plan Amendment also includes text changes to the General Plan which are required to achieve consistency between the General Plan and Resource Plan.

The Hayden Hill Resource Plan has two purposes:

- To compile an inventory of information on land use, circulation, housing, conservation, open space, noise, and public safety at Hayden Hill and in the vicinity; and
- To provide the policy framework, including goals, objectives, and policies, for development of mineral resources at Hayden Hill in concert with the management of other area resources.

The County will use the Resource Plan to evaluate the Hayden Hill Project proposed by Lassen Gold Mining, Inc. (LGMI), as well as any future mineral extraction development proposals at Hayden Hill. Any mineral resource development at Hayden Hill must be consistent with the goals, policies, and objectives of the Hayden Hill Resource Plan.

5.2.2 Resource Plan Project Description

The Resource Plan contains a Resource Inventory which describes the existing conditions in the Hayden Hill Planning Area and the immediate vicinity. The Resource Inventory is followed by seven plan elements. Six are required to be addressed in the California Planning and Zoning Law and General Plan Guidelines, as developed by the State Office of Planning and Research. The Mineral Resources Element is optional. The elements are:

- Mineral Resources Element;
- Land Use Element;
- Circulation Element;
- Housing Element;
- Conservation/Open Space Element;
- Noise Element; and
- Safety Element.

Each element opens with an overview of the issues facing Lassen County in planning for development of mineral resources at Hayden Hill. This is followed by the goals, objectives, and policies which will guide mineral extraction in the future. Following is a summary of the highlights of each Resource Plan element. Information on where to obtain a copy of the Resource Plan is in Section 5.1.

5.2.2.1 Mineral Resources Element

The major goal of the Mineral Resources Element is to provide for the development and management of mineral resources in a manner that minimizes land use conflicts and environmental impacts. Objectives and policies address ways to streamline the Project review, environmental review and project management process for mineral development projects. Policies are established for recreational mining plus all phases of mineral resource development, including exploration, mine development and operation, and reclamation.

5.2.2.2 Land Use Element

The Land Use Element contains the Hayden Hill Land Use Map showing land use designations within the planning area: General Forest Environment, Grazing and Sagebrush Environment, Prime Recreation Area and a new Mineral Resource Area covering the entire planning area. The type, density, intensity, and location of land uses permitted is defined. The Plan provides for short-term development of mineral resources. In the long term, following reclamation, land uses at Hayden Hill will be returned to grazing, timber uses and wildlife habitat. Goals include the improvement and diversification of Lassen County's industrial base by encouraging mineral resource development at Hayden Hill and the management of mineral resource projects to minimize land use conflicts and environmental impacts.

5.2.2.3 Circulation Element

The Circulation Element addresses roads and transportation as well as public facilities such as water, sewer, drainage, and other utilities. The goal is to develop and maintain a transportation system to accommodate mineral resource development. Public facilities goals address maintaining, improving and expanding public and private facilities needed by mining, and promoting energy conservation and efficiency.

5.2.2.4 Housing Element

Goals, policies and objectives in the Housing Element focus on assuring the adequate provision of housing to meet the needs of potential new employees in the mining industry and their families. The goal to provide an adequate supply of sound, affordable housing units in a safe and satisfying environment is based on goals in the County General Plan Housing Element. In addition, a housing impact analysis is required as part of the environmental analysis for any mineral resources project.

5.2.2.5 Conservation/Open Space Element

Conservation and open space goals seek to manage and minimize impacts on: Biological resources, including vegetation and wildlife; riparian corridors; water supply and water quality; grazing and timber; soils; scenic resources; cultural resources; and outdoor recreation. Natural hazards goals address geological hazards from earthquakes, landslides and other geologic hazards, flooding hazards, fire hazards, and air quality.

5.2.2.6 Noise Element

Noise goals are designed to protect Lassen County citizens from exposure to excessive noise, such as from industrial operations and blasting from mining activities at Hayden Hill. Goals also seek to protect the economic base of the County by preventing encroachment of incompatible land uses in areas designated for noise producing activities such as mining.

5.2.2.7 Safety Element

Preventing unnecessary exposure of natural resources, people and property to risks of damage or injury from hazardous materials is the hazardous materials goals. The emergency preparedness goal is to provide an adequate level of emergency police, fire, and health protection services to support mining development.

5.2.2 General Plan Amendment Text Changes

Following are amendments to the Lassen County General Plan:1990 required to achieve consistency between the Hayden Hill Resource Plan and the General Plan. Additions are underlined. Deletions are shown with strike outs ----.

1. Summary of Major Plan Proposals: Industrial, lines 4, 5, 6 (page 2), is amended to read:

   With proper controls, including closure and reclamation plans, heavy industries such as mining, smelting or special industries such as waste disposal could take place in unpopulated areas with low inherent agricultural or recreational value.

2. Summary of Major Plan Proposals–Recreation and Tourism, lines 9-13 (page 3), is amended to read:

   Projects suggested in the Plan include four ski and winter sports areas, campgrounds, a scenic railroad tour between Susanville and Westwood, a lumber museum at Westwood, a gold ~~mining~~ mine for tourists at Diamond Mountain, and interpretive signs and markers on historic and modern mining at Hayden Hill, and the development of summer camps in the forests and hot springs resorts and dude ranches in the open east County.

3. Land Use Element–Types of Industry, line 7 (page 22), is amended to add:

   Mining has the potential to contribute to the diversification of the County's economic base. For example, Hayden Hill has been the site of mining and exploration of gold and precious metals since the 1850's. With changes in the national and world economy, it may be economically feasible to extract minerals in those areas rich in mineral resources. To encourage development of mineral resources and to protect mineral resources from encroachment by incompatible land uses, areas with mining potential should be designated as a Significant Mineral Resource Area in conjunction with adoption of a Resource Plan. Following mineral extraction and reclamation of the land, the designation would be removed and the underlying land use designation would again guide development.

4. Land Use Element Industries--Miscellaneous, line 4 (page 23), is amended to read:

   Mining and ore reduction facilities-smelting, refining

5. Recreation and Tourism Element--West County, Tourism, line 8 (page 36), is amended to read:

   Hayden Hill: develop ~~the ghost town as a touring attraction~~ with interpretive signs and markers on historic and modern mining.

6. Recreation and Tourism Element--Class VI. Historic and Cultural Sites, line 4 (page 41) is amended to read:

   Hayden Hill Mining District could be developed into a tourist attraction while at the same time preserving it or developed with interpretive signs and markers on historic and modern mining in conjunction with mineral extraction activities.

7. Natural Resource Conservation Element (last line) page 54 is amended to add:

   Significant Mineral Resource Area

   Significant Mineral Resource Areas may be designated where precious metals are present, including gold and silver. In these areas, a Resource Plan can be submitted establishing goals, policies and objectives to guide development of mineral resources in the area.

8. As part of adoption of the Hayden Hill Resource Plan, the Lassen County General Plan Map is automatically amended to place a "Significant Mineral Resource Area" designation on the Hayden Hill Planning Area. This designation allows mineral resource extraction to take place in the planning area pursuant to the Hayden Hill Resource Plan.

5.3 Resource Plan Alternatives

This EIR examines the potential environmental impacts of three alternatives to the proposed Resource Plan. The No Project Alternative would preserve existing cultural and biological values and not develop mineral resources in the planning area. The second plan alternative is to reduce the scale of the mineral resources that would be extracted to half of that anticipated under the proposed Resource Plan either by operation at the same rate assumed in the Resource Plan but for half the time period, or by extracting mineral resources at half the rate for a longer time period. The third alternative is to target another area in the County for mineral resource development.

5.3.1 No Project: Preserve Cultural and Biological Values

The No Project Alternative assumes that current development policies would remain in effect without benefit of a resource plan. The Lassen County General Plan: 1990 would continue to guide development on private lands in the planning area. Existing land uses of rangeland, timber and wildlife habitat would continue under the General Plan land use designations of General Forest Environment, Grazing and Sagebrush Environment, and Prime Recreation Area. The Hayden Hill town site would remain. The potential for the site to be developed as a tourist attraction would be maintained. Mineral resource development could occur but without specific provisions to address compatibility with other land uses.

5.3.2 Reduced Scale Mineral Extraction

The Reduced Scale Mineral Extraction alternative assumes a resource plan would be adopted which would provide that the amount of mineral resources extracted would be reduced to half of that assumed with implementation of the proposed Resource Plan, which is considered to be the maximum-impact condition. Under this scenario, "reduced scale mineral extraction" means the ore would be mined in a shorter time period at the same rate, such as 4 or 5 years instead of the estimated 8 years.

5.3.3 Alternative Location

Under this alternative, a different area in the County would be selected for development of mineral resources, specifically gold and precious metals.

5.4 Environmental Impacts and Mitigation–Hayden Hill Resource Plan

5.4.1 Introduction

To analyze the potential impacts of implementation of the Resource Plan, it is assumed for most analyses that the proposed Project represents a maximum-impact scenario, and any other proposed mining project would not involve a significantly greater amount of disturbance than described in Chapter 2.0 and Section 4.2 of this document. Since it is feasible that alternative mining projects, other than the proposed Project, could be developed under implementation of the Resource Plan, quantification of the impacts will not be used. Impacts will be considered qualitatively.

Recommended changes and additions to goals, policies and objectives of the Resource Plan as mitigation for potential impacts are underlined. Deletions are shown with strike outs —.

5.4.2 Geology and Topography

5.4.2.1 Impacts to Geology and Topography

Changes to Topography and Grading Impacts

The goals, policies and objectives of the Mineral Resources Element are designed to minimize environmental impacts on geology and topography. Removal of gold, silver and precious metals from the ore would be a less than significant impact. However, the amount of earth and rock to be removed from Hayden Hill in order to remove the ore could be significant. The ore may be processed, stored and re-graded in the planning area or be removed from the area, which could also have impacts. In addition to the direct impact of moving soil and rock, the location and extent of grading would have secondary impacts on soils, drainage, biological resources, and visual resources. These impacts are addressed in Sections 5.4.3, 5.4.4, 5.4.5, 5.4.6, and 5.4.15. State and Federal permitting agencies will require grading plans as part of permit applications. In conjunction with the proposed Project mitigation measures, these will ensure the mitigation of any potentially significant impacts. If the proposed Project does not receive the necessary approvals or otherwise does not proceed, similar mitigation measures should be applied to any mining activity with the potential for causing similar impacts in the planning area.

5.4.2.2 Mitigation Measures for Impacts to Geology and Topography

Mitigation for Changes to Topography and Grading Impacts

- Add a new policy to Mineral Resources Goal 2, Objective B, Mine Development and Operation Policies:

    - Policy 4--Lassen County shall require submittal and implementation of a project-specific grading plan pursuant to the Surface Mining and Reclamation Act (SMARA) to address grading and erosion control for mining operations.

5.4.3 Soils

5.4.3.1 Impacts to Soils

Increased Erosion Potential

The potential impact of implementing the Resource Plan on soils would be similar to those of the proposed Project as described in Section 4.2.3.2. Topsoil would be removed from Hayden Hill to reach mineral deposits and removed from the planning area or stored and used for reclamation. This disturbance would affect the success rate of revegetation during reclamation. The potential for increased surface water runoff and soil erosion would increase on disturbed soils due to compaction, reduction of soil depth and reduction of infiltrative surfaces. There may also be increased potential for wind erosion from stockpiled soils and from areas where soil is removed.

5.4.3.2 Mitigation Measures for Impacts to Soils

Mitigation for Increased Erosion Potential

The goals, objectives and policies of the Mineral Resources Element of the Resource Plan are designed to mitigate potential impacts to soils. To further mitigate impacts, an erosion control plan should be prepared for mineral resource development projects.

- Add a policy to Mineral Resources Goal 2, Objective C, Reclamation Policies.
    - Policy 7--An erosion control plan shall be submitted to the appropriate jurisdictional agency for review and approval before reclamation activities commence and shall be implemented.
- Add a policy to Mineral Resources Goal 2, Objective B, Mine Development and Operation Policies.
    - Policy 5--An erosion control plan shall be submitted to the appropriate jurisdictional agency for review and approval before mining activities commence and shall be implemented.

5.4.4 Vegetation and Wetlands

5.4.4.1 Vegetation and Wetlands Impacts

Grazing and Timber Production Impacts

With implementation of the Resource Plan, mining activities could directly remove viable timber stands within the Jeffrey Pine/Mountain Shrub plant community. In the Conservation/Open Space Element, Policy 3 of the Grazing and Timber Goal's Objective A requires that mining reclamation plans include tree planting to restore forestry resources of impacted areas where feasible. However, the vegetational impacts analysis for the mining Project indicates that past reclamation efforts in Jeffrey Pine/Mountain Shrub habitat to produce a commercially viable timber where the soil has been removed have not been successful. Without extensive soil structure replacement, a permanent loss of timber resources in the planning area would result.

The amount of land used for timber production that would be impacted by proposed mining activities is small in relation to the amount of land that can potentially be used for forestry production in adjacent areas in the planning area and the surrounding Modoc National Forest. Because of these adjacent timber production areas, the permanent, unavoidable impact of timber production loss where soils are excavated would be less than significant.

Implementation of the Resource Plan would directly remove grazing lands from the planning area. The potential for grazing land reclamation is higher than for timber production, so the adverse impact would be mitigated to a less than significant level if Policy 3 of Objective B of the Grazing and Timber Goal is implemented. This objective requires mining reclamation plans "to provide for the reclamation of rangeland grazing resources in the affected area".

Vegetation Impacts

Implementation of the Resource Plan would allow for mining in the planning area, and would cause direct losses of portions of all the recognized plant communities within the planning area, including the Jeffrey Pine/Mountain Shrub, Upland Shrub, Low Sagebrush, and Meadow plant communities, as described in Section 4.2.4. In addition to direct impacts, indirect adverse impacts to these plant communities would result from the potential introduction of more non-native, adventitious plant species that could be introduced from the disturbed areas. Another adverse indirect impact from removal of vegetation is the potential for increased erosion and sedimentation from areas that are disturbed. This erosion can impact plant communities adjacent to and downgrade from the disturbed vegetation.

Disturbed areas could be reclaimed, but exact reconstruction of the existing plant communities, especially the Low Sagebrush plant community, would not be feasible since the soils will be greatly disturbed in the mining process. Some permanent loss of the existing plant community would occur. Reclamation efforts must successfully revegetate the disturbed areas. However, the specific combination of plant species diversity and abundance that characterizes the Low Sagebrush plant community would be permanently lost in those areas of direct disturbance.

The objectives and policies under Biological Resources Goal 1 of the Conservation/Open Space Element promote and encourage protection and revegetation of native plant species. However, additional policies to help mitigate for adverse impacts described above are proposed in Section 5.4.4.2. With implementation of these mitigation measures, potential adverse impacts to vegetation would not be significant.

Wetlands Impacts

Implementation of the Resource Plan may result in the direct and indirect loss of wetlands, including several natural seeps and springs, by actual removal, filling, or by influencing the hydrology that supports the wetlands. These impacts are similar to those described in Section 4.2.4.2. The loss of wetlands would be a significant adverse impact. As described in Section 4.2.4.3, requirements for mitigation efforts for wetlands impacts are determined by the U.S. Army Corps of Engineers (COE) under jurisdiction established by the Clean Water Act.

Wetlands are typically important habitat, and the Resource Plan policies meant to protect important habitats would, in most cases, be applied to wetland habitats as well as upland habitats. Additionally, objectives that apply to Biological Resource Goal 2 involve riparian corridors, which normally contain some wetland habitat. However, given the recognized importance of wetland functions, such as their use as groundwater recharge sites, stormwater interception, and as habitat for migratory waterfowl, specific reference to wetlands should be added to the Resource Plan to help ensure that wetlands impacts would be mitigated to the point of insignificance. It should be recognized, however, that some areas which can be described as wetlands under some criteria may not by considered significant in a qualitative sense. Impacts to wetlands of low habitat value could be compensated by development of new wetlands in appropriate areas in the vicinity.

Impacts to Special-Status Plant Species

Impacts to special-status plant species that could result from implementation of the Resource Plan are similar to those discussed in Section 4.2.4. A mining project could possibly impact *Antennaria flagellaris*, a species which has been examined for sensitivity under the California Environmental Quality Act (CEQA), although it is not listed by the State of California or by the federal government as being rare, threatened or endangered, depending on the location of mining activities. Other species listed as species of special concern by California Department of Fish and Game (CDFG) exist on the site and may not be threatened, depending on the location of mining activities. Since Policy 2 under Objective B of Biological Resource Goal 1 explicitly requires mitigation "for impacts to rare, threatened, or endangered species and sensitive habitats in the planning area caused by development activities", any adverse impacts to these species and habitats would be mitigated and the impact would not be significant.

5.4.4.2 Vegetation and Wetlands Mitigation

Grazing and Timber Production Mitigation

No mitigation is required.

Plant Communities Mitigation

Mitigation of impacts to vegetation lie primarily in the feasibility of the mining reclamation plan.

- Add the following to help ensure that Biological Resources Goal 1 is met:

- Objective C. Any mining activity should be accompanied by a Reclamation Plan that minimizes impacts to biological resources of the planning area.

- Policy 1--Lassen County and/or the California Division of Mines and Geology (DMG) will exercise its authority to participate in the SMARA regulatory process in relation to reclamation of native vegetation communities disturbed by mining processes.

- Policy 2--Lassen County and/or DMG will consult with biologists or resource managers from the United States Forest Service (USFS), Bureau of Land Management (BLM), and CDFG during its review of mining reclamation plans, and consider their comments and concerns before approving the reclamation plan.

- Policy 3--Lassen County and/or DMG will only approve reclamation plans that encourage revegetation of disturbed areas to the extent feasible, and will encourage revegetation with native vegetation similar to existing vegetation, unless this is infeasible due to excessive slope or permanently altered soil conditions.

Wetlands Mitigation

As discussed in Section 4.2.4, mitigation for wetlands impacts is regulated by the COE, and in some cases by the CDFG. However, certain wetlands in the planning area may fall under a nationwide permit, and the COE may not require mitigation.

- Change Biological Resources Goal 2 to read:

Biological Resources Goal 2

- To provide protective measures for riparian corridors along selected streams and wetlands within the planning area, which balance the need for grazing, recreation, timber and mining operations, wildlife, and flood control with preservation of riparian and wetland values.

- Change Objective B under Biological Resources Goal 2 to read:

- Objective B. Encourage land use practices that minimize impacts to native plant species to the extent feasible within riparian corridors and wetlands.

- **Change two of the policies for Objective B, Biological Resources Goal 2, to include wetlands, and add a new Policy to specify mitigation procedures for impacted wetlands within the planning area.**
  - **Policy 1--As part of land use permitting, encourage revegetation with native species in areas that are temporarily disturbed in riparian corridors and wetlands during development.**
  - **Policy 2--Encourage private and public projects to minimize encroachment on riparian corridors and wetlands.**
  - **Policy 3--Requirements for the Conditional Use Permit (CUP) should include the replacement of all impacted wetlands at a ratio of at least 1:1 either on-site or off-site, or a wetlands replacement plan that the County approves after consultation with biologists, wardens, or resource managers from the COE, USFS, BLM, and United States Fish and Wildlife Service (USFWS) for federally owned lands, or from the COE and CDFG for privately owned lands.**

Special-Status Plant Species Mitigation

Under terms of the Resource Plan policies, significant impacts to species of special concern would be mitigated. No significant adverse impacts are anticipated due to implementation of the Resource Plan.

No mitigation is required.

5.4.5 Wildlife and Aquatic Biology

5.4.5.1 Wildlife and Aquatic Biology Impacts

Wildlife Impacts

Implementation of the Resource Plan would allow for mining activities in the area, which has the potential to impact hundreds of acres used by wildlife in the area. Impacts to terrestrial wildlife would be similar to those identified for the proposed Project, in Section 4.2.5.2.

Depending on the location of the mining facilities, long-term and adverse impacts would occur to: Sage grouse breeding habitat and critical winter habitat; mule deer habitat; pronghorn antelope habitat for summer range and kidding areas; Modoc sucker access; potentially one goshawk pair using large mature trees; and golden eagle and prairie falcon foraging areas and prey. Habitat loss, increased disturbance, noise, and risks from hazardous materials spills would be potential impacts to wildlife in the planning area resulting from mine operation and development.

The USFWS would require mitigation efforts for the impacts listed above for any proposed project. The CDFG would also require mitigation for these impacts pursuant to the California Endangered Species Act of 1984. Since Policy 2 under Objective B of Biological Resource Goal explicitly requires mitigation "for impacts to rare, threatened, or endangered species and sensitive habitats in the planning area caused by development activities", any adverse impacts to these species and habitats would be mitigated and the impact would not be significant.

Impacts to wildlife due to noise generated by mining activities would be similar to those described for the proposed Project in Section 4.2.14.2. According to the literature search conducted for the proposed Project, there is no conclusive evidence that noise emissions similar to those anticipated for the proposed Project would have a serious, adverse impact on the behavior, reproduction, and survival of domesticated and wild animals in the Project area. Potential impacts of mining-related noise on wildlife would be less-than-significant. Any mitigation would be applied on a Project-specific basis as part of the Conditional Use Permit process.

Impacts to Aquatic Biology

Implementation of the Resource Plan could potentially result in the same impacts described for the proposed Project in Section 4.2.5.3. It is assumed that the Modoc sucker (*Catostomus microps*) is present in Willow Creek, which receives runoff from the planning area. The Modoc sucker is listed as federally endangered, so that impacts to water quality and fish movements are highlighted in the planning area. Mining activities could introduce sediments and contaminants into the streams in the planning area. Principal issues are construction of the culvert over Willow Creek, and the potential for acidification of the stream and the siltation of streams in the area.

Fortunately, measures can be taken to protect aquatic life in the planning area. Under Section 7 consultation, the USFWS is charged with carrying out the Endangered Species Act of 1973 that protects endangered species such as the Modoc sucker. Mitigation measures required as part of Section 7 consultation and diligent monitoring and enforcement of these measures will help protect the planning area's streams.

5.4.5.2 Mitigation for Wildlife and Aquatic Biology

Wildlife Mitigation

Under terms of the Resource Plan policies, significant impacts to special-status species would be mitigated. However, potential impacts to wildlife habitat in areas where there would be a potential short-term loss of vegetative cover of large areas of Jeffrey Pine/Mountain Shrub and Low Sagebrush vegetation could be significant. The following changes should be made to mitigate adverse impacts to wildlife habitats to a less-than-significant level:

- Change Policy 4 of Objective A of Biological Resources Goal 1 to read:
    - Policy 4--When critical habitats are subject to significant environmental impacts, a habitat management plan must be prepared which describes mitigation measures to be undertaken that involves either on-site or off-site compensation ~~shall be considered~~ with the objective of providing no less than equivalent habitats.

Aquatic Biology Mitigation

The mitigation measures for the proposed Project would be appropriate for any project developed pursuant to the Resource Plan. Similar measures would be applied to any mining activity, or other activity with the potential for causing similar impacts, that could operate within the planning area. Monitoring of groundwater should be conducted, as well as monitoring of surface water for potential acid rock drainage impacts. Changes to Policy 1, Objective A of the water resources and water quality goal described for surface water mitigation will help ensure proper monitoring occurs.

5.4.6 Water Resources

5.4.6.1 Impacts to Water Resources

Surface Water Impacts

Implementation of the Resource Plan could potentially lead to similar impacts to surface water runoff, as identified for the proposed Project, from mining facilities, especially the mining pit, tailings impoundment, heap leach facilities, and the waste rock dump. It is possible that mining operations would encounter rocks with the potential for acid rock drainage. The mitigation measures required for the proposed Project should be incorporated into the Resource Plan by a more specific reference to the requirements of the California Code of Regulations.

Assuming that the impacts analysis for the mining operation is based on reliable data, and that the mitigation measures proposed in Section 5.4.6.2 are implemented, no significant adverse impacts to water quality should result from implementation of the Resource Plan.

Groundwater Impacts

The impacts of implementing the Resource Plan would be similar to those identified for the proposed Project, as presented in Sections 3.6 and 4.2.6. Shallow groundwater systems would be impacted, especially those seeps and springs located where the proposed mining operation would occur. This impact would be an unavoidable impact, since the seeps are likely to be lost as a result of mining activities in the planning area. Because shallow groundwater systems are common in the planning area vicinity, and the regional groundwater systems will not be impacted, this unavoidable impact to shallow groundwater in the mining area is less than significant.

The Resource Plan should be modified to encourage continued monitoring of groundwater to ensure that contamination will not be unnoticed after the mining operations stop.

Based on the groundwater information on the proposed Project, no significant impacts to groundwater should result from implementation of the Resource Plan, given that the requirements established in the Water Resources and Water Quality Goal, as well as requirements established by the Regional Water Quality Control Board, are met.

5.4.6.2 Mitigation for Water Resources

Surface Water Mitigation

The following changes to the Resource Plan Water Resources and Water Quality Goal, should be made as a mitigation measure for potential impacts to surface water in the Hayden Hill planning area:

- Change Policy 1 under Objective A to read:
    - Policy 1--Protect watershed and groundwater recharge areas by managing the placement of potential pollution sources and by complying with all applicable State and Federal groundwater protection requirements, including those listed in the California Code of Regulations, Title 23, Chapter 15, Article 7 (Mining, Waste Management), and the California Porter-Cologne Water Quality Act of 1985.

Groundwater Mitigation

The Resource Plan should be modified to allow for continued monitoring of groundwater to ensure that contamination will not be unnoticed after the mining operations stop. The changes to Policy 1 of Objective A of the Water Resources and Water Quality Goal described for surface water mitigation above will help ensure that proper monitoring occurs.

5.4.7 Air Quality

5.4.7.1 Air Quality Impacts

Increased Air Emissions

The air quality evaluation of the Resource Plan is based on the results of the air quality analysis presented in Section 3.7 of this EIR/EIS. It is assumed that the proposed Hayden Hill Project represents a maximum impact upon air quality for purposes of evaluating the Resource Plan in terms of the Project size, number and size of operations, annual prediction quantities, types of air pollution control used, and numbers of employees. The air quality analysis of the Hayden Hill Project is assumed to be complete and accurate (Air Sciences 1991).

Air quality impacts of implementing the Resource Plan are expected to be similar to those described for the proposed Project in Section 4.2.7, except for 24-hour particulate matter of 10 microns diameter (PM10) impacts and hydrogen cyanide (HCN) impacts. PM10 impacts from Project operations were not compared to the 24-hour standard. The 24-hour California PM10 standard is 50 $\mu g/m^3$. Meteorology that produces higher impacts is more likely to persist on a 24-hour basis than an annual basis. Project 24-hour impacts plus a background concentration may exceed the 24-hour California PM10 standard.

Annual HCN impacts from the proposed Project were predicted. The predicted annual HCN impact was compared to an 8-hour worker exposure concentration. If the HCN impacts were compared to a public exposure criterion with the same averaging time, the HCN impact to the public may be considered to be significant.

Mercury emissions were negligible, so potential impacts were estimated to be insignificant when compared to either a worker exposure or public exposure criterion.

5.4.7.2 Air Quality Mitigation

Mitigation for Increased Air Emissions

Implementation of Air Quality Goal, Objective A, Policy 1 requires compliance with emission standards set by the Air Resources Board and Lassen County Air Pollution Control District (LCAPCD) pursuant to the California Health and Safety Code, Division 26, Part 2, State Air Resources Board, Chapter 3.0, and the Lassen County Air Pollution Control Regulations Rule 4. The LCAPCD would require assessment of mitigation for PM10, HCN, and mercury emissions associated with mining activities. Policy 2 would require that construction and operations impacts be assessed on a project-specific basis through the environmental review process. These policies would mitigate potential impacts due to PM10, HCN, and mercury, as well as other criteria pollutants.

Outdoor Recreation Goal Objective A, Policy 1 restricts public access in areas that are potentially unsafe, such as access near mining operations. This would limit public access to potentially high HCN impact areas. Implementation of these policies would mitigate potential air quality impacts of implementing the Resource Plan and subsequent development of a mine at Hayden Hill. Specific air quality impacts would be evaluated and mitigation would be identified during environmental review of proposed projects.

No mitigation required.

5.4.8 Employment

5.4.8.1 Employment Impacts

Increased Employment Opportunities

Mineral Resources Goal 1 in the Resource Plan Mineral Resources Element is to improve and diversify the County's industrial base by encouraging mineral resource development at Hayden Hill. The Resource Plan would generate both direct employment opportunities in the mining sector of the local economy and secondary jobs in the service sector in both the planning area and the surrounding communities. Employment from mining operations would be located in the planning area. Mining administration and secondary jobs would be located in the adjacent communities of Susanville, Bieber, Adin, and Alturas.

Under the maximum-impact scenario, it is estimated that development of a mine at Hayden Hill could employ up to 150 workers during the pre-production phase and generate about 200 full time jobs during mining operations. About 50 percent of the new jobs could employ workers from the local labor pool, while the rest could employ new residents that have moved into the area. These new non-local or immigrating workers in the planning area would stimulate secondary employment in the commercial and service base of the communities where these workers choose to live. It is estimated that about 80 secondary jobs would be generated during mine operation (Section 4.2.8.2).

Employment growth generated by Resource Plan implementation would have a beneficial impact on the local economy. It would also be consistent with the County's Overall General Plan Goal 2, to improve and diversify the industrial base (Lassen County General Plan 1968). Mining operations would also generate revenue for the County since property taxes for the planning area would increase. However, employment growth may have potential indirect impacts on the demand for local housing. These indirect, potentially significant impacts are addressed in Section 5.4.10.1, Housing Impacts.

5.4.8.2 Mitigation Measures for Employment Impacts

No mitigation is required.

5.4.9 Population

5.4.9.1 Population Impacts

Increased Population

Resource Plan implementation would stimulate population growth in and around the planning area of up to about 350 people during the operation of mining activities (Section 4.2.8). This represents a 1.3 percent increase in County population. This incremental population growth would be distributed among the communities of Susanville and Bieber in Lassen County and Adin and Alturas in Modoc County.

A change or increase in population by itself would not have a significant impact on the planning area. However, population growth associated with implementing the Resource Plan may generate increased demand for public services and housing which could have potential environmental impacts. Potential public service impacts are addressed in Sections 5.4.12.1, 5.4.12.2, 5.4.12.3, 5.4.12.4, and 5.4.12.5. Housing impacts are addressed in Section 5.4.10.1.

5.4.9.2 Mitigation Measures for Population Impacts

No mitigation is required.

5.4.10 Housing

5.4.10.1 Housing Impacts

The potential impacts of implementing the Resource Plan would be similar to those identified for the proposed Project in Section 4.2.8.2.

Increased Housing Demand for Single-Family, Multi-Family, and Mobile Homes

Resource Plan implementation would have an impact on the available supply of housing in the communities within commuting distance of the planning area. Housing supply, type and location would be adequate to meet the demand to purchase or build both single-family and mobile homes in the vicinity of the planning area. There would not be a substantial impact on the existing housing market for these types of units (Section 4.2.8.2). However, there may be a shortage of rental multi-family units.

Short-Term Construction Worker Housing Demand

The highest demand for temporary or rental housing would occur during the construction phase of any large mining activities. Construction workers would require temporary housing on a short-term basis, which may include multi-family and single-family rental units, and trailer parks for recreation vehicles and trailers. If workers choose to camp or locate at the USFS Willow Creek Campground near the planning area, it could have a potentially significant impact on the availability of camp sites for recreational users (Section 4.2.8.2).

Indirect Housing Impacts

Housing speculation may be triggered by induced housing demand. This may result in an excess supply of new housing units in outlying rural communities such as Adin and Bieber and increased demand for providing public services in these areas (Section 4.2.8.2). When permanent and construction workers leave the area, these housing units in outlying areas may remain vacant, creating a "boom and bust" housing market.

5.4.10.2 Mitigation Measures for Housing Impacts

Mitigation for Increased Housing Demand

Implementation of the Lassen County General Plan Housing Element (Lassen County 1986) would address housing issues County-wide, while implementation of the Susanville Area Plan would address similar housing goals in that community, which would probably be the residence of many new mining employees and families. Objectives in the General Plan Housing Element that would help mitigate other identified housing impacts are described below.

No mitigation is required.

Mitigation for Short-Term Construction Worker Housing Demand

Implementation of the Lassen County Housing Element Objective 6, Fulfilling Special Housing Needs, and Objective 8, Providing Emergency Housing, would mitigate the potential impacts of the need for construction worker housing. A specific implementation program identified for Objective 6 encourages the County to review applicable housing project proposals to ensure provision of housing for special-needs groups. Temporary construction workers should be considered in this group. Objective 8 states that the County shall try to provide emergency shelter on a short-term emergency basis. This objective would be applicable if potential construction workers cannot find rental housing and require short-term emergency shelter (Lassen County 1986).

Implementation of Objective B, Policy 1 in the Resource Plan Housing Element would further mitigate temporary housing demand impacts generated by non-local employees. Policy 1 requires completion of a housing impact analysis for mining projects in the planning area prior to development of any mineral resource activities.

No mitigation is required.

Mitigation for Indirect Housing Impacts

Mitigation for possible public service impacts associated with housing development is addressed in Section 5.4.12.

Implementation of the Lassen County General Plan Housing Element, Objective 4, Rehabilitation and Replacing Existing Housing Stock, and Objective 5, Conserving Existing Housing, would reduce indirect housing impacts associated with excess housing supply (Lassen County 1986).

No mitigation is required.

5.4.11 Education

5.4.11.1 Education Impacts

School District Operating Costs

Resource Plan implementation could induce short-term population growth in the communities in the vicinity of the planning area, including Susanville, Bieber, Adin and Alturas. This potential growth would have impacts on education similar to those described for the proposed Project in Section 4.2.8.4. Specifically, an increase of about 80 school-age children would generate increased operating costs associated with enrollment increases in the school districts.

Required Facilities, Equipment and Staffing

Resource Plan implementation could increase the demand for school facilities, equipment and staff to accommodate growth. School districts currently at or above enrollment capacity include Susanville Elementary, Lassen Union High, and the elementary school in the Big Valley Joint Unified School District. An increase in the area's student population would have a significant impact on the ability of existing facilities to accommodate this growth.

5.4.11.2 Mitigation Measures for Education Impacts

- Add a new Education Goal, objective and supporting policy in the Housing Element to mitigate these impacts and accommodate potential population growth.

Education Goal

- To provide present and future residents of the County with adequate school facilities and services to meet projected population growth of school-age children.

- Objective A. The school districts should evaluate alternative financing sources to fund necessary school district improvements.
    - Policy 1–The affected school districts should consider developing a school impact fee program for all new commercial and industrial development in school districts with capacity constraints.

5.4.12 Local Government Facilities and Services

5.4.12.1 Water and Sewer Service

Water and Sewer Service Impacts

Water and Sewer Capacity. Water and sewer service impacts generated by Resource Plan implementation would be similar to those identified for the proposed Project as described in Sections 3.8.7 and 4.2.8.5. There is adequate capacity at both the Susanville Water Department and Consolidated Sanitary District, Lassen County Water Works, Adin Community Services District and Alturas water and sewer systems to accommodate potential water and sewer demands in those communities associated with new residents attracted by mining employment opportunities.

Resource Plan implementation would not have a significant impact on existing water and sewer capacities at facilities surrounding the planning area. Water and sewer service to support mining activities in the planning area would be addressed when a project is proposed.

Infiltration. Potential sewer service demands on the Adin sewer system may exacerbate its current infiltration problems, and would be a potentially significant impact (Section 4.2.8).

Mitigation Measures for Water and Sewer Service Impacts

Implementation of Public Facilities Goal 1 and Policies 2 and 3 in the Circulation Element would mitigate potential water and sewer service impacts. Public Facilities Goal 1, Policy 2 requires that Project sponsors provide water, sewer and other utility services to meet the needs of mineral resources development. Policy 3 encourages sizing water and sewer facilities to accommodate mining activities and discourage unplanned residential growth.

No mitigation is required.

5.4.12.2 Law Enforcement

Law Enforcement Impacts

Required Personnel. Implementation of the Resource Plan could have a potentially significant impact on law enforcement services in the planning area. These impacts are similar to impacts described in Section 4.10.5, Local Government Facilities and Services, for the proposed Project. Current and projected staffing of the Lassen County Sheriff's Department would be inadequate to serve additional demands for traffic enforcement and emergency response services in the planning area. The CDFG would also be responsible for enforcing wildlife protection in the planning area.

Funding. Lassen County will be required to reduce its 1990-1991 fiscal budget by 1.8 million dollars. These budget reductions restrict the County's ability to fund the expansion of law enforcement services. This lack of funding would also be a significant impact.

Mitigation Measures for Law Enforcement Impacts

- Amend Emergency Preparedness Goal Policy 2 in the Safety Element to mitigate identified impacts.
  - Policy 2-- Determine the structural, equipment, and personnel needs to provide emergency services to the planning area, and require that project sponsors provide adequate private services to meet project law enforcement, fire protection, and emergency medical service needs.

5.4.12.3 Fire Protection

Fire Protection Impacts

Required Equipment and Personnel. The potential impacts of implementing the Resource Plan on fire protection would be the same as those for the proposed Project. Both the Susanville Fire Department and Susan River Fire Protection District are under-staffed and have inadequate equipment to support future growth. However, both the Big Valley and Adin Fire Protection Districts could both accommodate growth generated by Resource Plan implementation and subsequent development of mineral resources at Hayden Hill.

The California Department of Forestry and Fire Prevention (CDFFP) and BLM fire stations in the planning area vicinity have adequate staffing and equipment levels to continue non-structural fire protection. Staffing, facilities and equipment at the eight USFS stations in the Modoc County area are presently adequate. The two USFS guard stations in the Lassen County National Forest which are in the Eagle Lake Ranger District could not serve any growth in the area without increasing staff and equipment.

Due to formal and informal mutual aid agreements between the local fire districts and State and Federal agencies, implementation of the Resource Plan would not have a significant impact on fire protection services in the planning area (Section 4.2.8).

Mitigation Measures for Fire Protection Impacts

Implementation of Fire Hazards Goal Objective A, Policy 2 and Objective B, Policy 1 in the Conservation/Open Space Element would mitigate potential impacts on fire protection services. The fire hazard policies require on-site fire detection and suppression devices and referral of proposed projects to the affected fire districts for consideration.

- Amend Emergency Preparedness Goal Policy 2 in the Safety Element as follows:
    - Policy 2-- Determine the structural, equipment, and personnel needs to provide emergency services to the planning area, and require that project sponsors provide adequate private services to meet project law enforcement, fire protection, and emergency medical service needs.

5.4.12.4 Health Services

Health Service Impacts

Staffing. Growth generated by Resource Plan implementation would have similar impacts on health services to those described for the proposed Project in Section 4.2.8. Lassen Memorial Hospital and the Northeastern Rural Center in Susanville, and the Big Valley Medical Center, which serves both the communities of Bieber and Adin, would have adequate staff to accommodate this growth. Resource Plan implementation would not have a significant impact on medical facility staffing.

Facilities and Services. Implementation of the Resource Plan could have potentially significant impacts on several medical facilities and services. Ancillary services and direct patient care at Lassen Memorial may require expansion to accommodate future growth. In addition, inadequate facilities at Big Valley Medical Center and equipment deficiencies at the Northeastern facility would also have a potentially significant impact on the ability to provide regular and emergency medical services.

Mitigation Measures for Health Service Impacts

- Amend Emergency Preparedness Goal Policy 2 in the Safety Element as follows:
  - Policy 2– Determine the structural, equipment, and personnel needs to provide emergency services to the planning area, and require that project sponsors provide adequate private services to meet project law enforcement, fire protection, and emergency medical service needs.

5.4.12.5 Solid Waste Disposal

Solid Waste Disposal Impacts

Nonhazardous Wastes. The Lassen County landfills at Bass Hill and Bieber have sufficient capacity to accommodate future nonhazardous solid wastes (municipal wastes) generated by potential population and employment growth associated with Resource Plan implementation. User fees from these existing landfills currently pay for operating costs, but would not cover the fees for siting a new landfill (Section 3.8.11). Any increase in demand for nonhazardous solid waste services would not have a significant impact on existing disposal facilities.

Hazardous Wastes. Potential hazardous wastes generated by mineral resource or other activities in the planning area currently could not be disposed in any of the 6 existing County landfills. Hazardous waste disposal would require construction of a new Class I landfill facility that would accept designated wastes or transport to an appropriate facility outside of Lassen County. Class I facilities provide special containment features to isolate the wastes from the environment. Selection of the appropriate waste disposal option would depend on the estimated amount of hazardous wastes generated in the planning area. Impacts associated with either of these two waste disposal options are briefly described below.

New Class I Facility. Policies in the Resource Plan's Safety Element address siting criteria for hazardous material disposal facilities. Due to the high costs associated with facility construction, this option would have a significant fiscal impact. Projected estimates of hazardous wastes generated by mining or other activities in the planning area are not available. However, assuming that the amount of hazardous wastes would be minimal, Resource Plan implementation would not justify new facility construction.

Export Wastes. The nearest operating Class I landfill is the Chemical Waste Management's Kettleman Hills landfill (Kettleman Hills), located 4 miles outside of Kettleman City in Kings County. This facility is approximately 330 miles south of the planning area. As of January 1, 1990, Kettleman Hills had a remaining air space capacity of 1.1 million cubic yards. An additional 3.5 million cubic yards are projected to be available at a new landfill site at this facility in 1991 (CH2M Hill 1990).

There is sufficient capacity at Kettleman Hills to accommodate planning area hazardous wastes. The increased demand for hazardous waste services generated by Resource Plan implementation would not have a significant impact on existing Class I disposal facilities.

Mitigation Measures for Solid Waste Disposal Impacts

No mitigation is required.

5.4.13 Land Use

5.4.13.1 Land Use Impacts

The land use impacts associated with implementing the Resource Plan would be similar to those identified for the proposed Project in Section 4.2.9.2. Two types of land use impacts are addressed. The first is consistency of the proposed Resource Plan with existing County, State and Federal plans and policies. The second is the potential compatibility or conflict between mineral resource development activities and rangeland, timber, wildlife habitat and recreation uses, both in the planning area and in the vicinity.

Consistency with County, State and Federal Plans

Development of mineral resources is consistent with adopted plans and policies of USFS Modoc National Forest and the BLM. Both Federal agencies recognize Hayden Hill as a significant mineral resource area with high potential for mineral exploration.

Mineral resource extraction at Hayden Hill is also consistent with the Lassen County General Plan. Adoption of the General Plan text changes and the Resource Plan will increase consistency between the General Plan and mining activities and designate Hayden Hill as a Significant Mineral Resource Area. Mining is also consistent with Zoning Districts in the planning area. These include: Upland Conservation District (U-C) and Upland Conservation District/Resource Management (U-C-2). The County has determined that short-term mining operations are also consistent with the Agricultural Preserve Combining District (A-P), which covers part of the planning area, when agricultural uses are non-prime and reclamation plans provide for reclamation of pre-existing agricultural values. The County may also consider cancellation of all or part of lands under the Williamson Act, when such lands will be disturbed by mining operations.

With adoption of the Resource Plan and General Plan text changes that are part of the Resource Plan, a Significant Mineral Resource Area will be designated at Hayden Hill. This Resource Plan fulfills the new General Plan requirement for development of mineral resources at Hayden Hill.

Short-Term Displacement of Land Uses
Use of land within the planning area for mining would displace existing land uses on a short-term basis. Existing rangeland, timber, wildlife habitat and recreation uses would be disrupted or eliminated during the estimated 10-year period of mine operation. With reclamation of the land, land uses could substantially return to current uses. However, wildlife habitat and recreation uses may be enhanced due to Project-specific conditions of approval or mitigation required for Project development and as part of reclamation. Some other uses may not be able to be restored to pre-mining conditions. For example, it is unlikely that part of the Low Sagebrush vegetation could be re-established, and it is unlikely commercial timber productivity can be reproduced on all of the Jeffrey Pine/Mountain Shrub vegetation areas, even after reclamation. This displacement of land uses would not be a significant impact.

Potential Existing and Future Land Use Conflicts
Using SMARA definitions for compatible and incompatible land uses, as well as definitions for interim and buffer uses intended to give the County additional guidance for future development, mineral resource development at Hayden Hill would be consistent with existing land uses, including rangeland, timber, wildlife habitat and recreation. However, there could be conflicts between timber and grazing uses and mining activities. Commercial timber activities, such as logging and hauling could conflict with mining construction equipment and operations. Since grazing allotments are in a portion of the planning area, reduced area for cattle grazing could create problems for ranchers. Recreation land uses would be impacted as described in Section 5.4.17, Recreation.

5.4.13.2 Mitigation Measures for Land Use Impacts

Mitigation for Consistency with County, State and Federal Plans
No mitigation is required.

Mitigation for Short-Term Displacement of Land Uses
The potential impacts of short-term displacement of existing uses could be mitigated by adding a policy to the Land Use Element.

- Add a policy to the Land Use Goal, Objective C:
  - Policy 3--Project sponsors should minimize the short-term loss of rangeland and timber by complying with BLM and/or other agencies regarding management of grazing allotments and commercial timber sales during mining activities on public and private land.

Objective C, Reclamation Policies, of Mineral Resource Goal 2 under the Mineral Resource Element describes objectives for rangeland, timber, wildlife habitat and recreation reclamation for the planning area that are to be carried out to the extent feasible.

Mitigation for displacement of recreation uses is addressed in the recreation section of the Conservation/ Open Space Element of the Resource Plan. It provides for locating an alternative recreation and wildlife corridor through the planning area during mining activities.

Mitigation for Potential Land Use Conflicts

Mineral Resource Element and Land Use Element goals, objectives and policies are specifically designed to minimize environmental impacts and land use impacts. Implementation of Land Use Goal Objective B would also protect the opportunity for mineral resource development at Hayden Hill from new land uses which could create future conflicts. The policy states that compatibility with mineral resource development should be addressed during the environmental review process for new projects. Any use which may create a conflict may not be permitted adjacent to the Hayden Hill Planning Area.

No mitigation is required.

5.4.14 Cultural Resources

5.4.14.1 Cultural Resource Impacts

The potential impacts of implementing the Resource Plan on cultural resources would be similar to those for the proposed Project as described in Section 4.2.10. Cultural resources are subject to review by the California State Historic Preservation Office (SHPO), BLM, and the Advisory Council on Historic Preservation (ACHP). A detailed mitigation plan (data recovery plan) has been submitted to BLM and SHPO for the proposed Hayden Hill Project. Upon concurrence of the BLM, SHPO and ACHP, the data recovery plan would be implemented. Implementation of this plan would recover data from adversely affected sites prior to further disturbance.

Direct Impacts to Identified Cultural and Historic Resources

Construction of a mining project could have direct adverse impacts to cultural resources in the planning area, depending on the location of the mining facilities and operations. Identified cultural resources that could be significantly affected by mineral resource development include the Hayden Hill town site and fire tower, and two domestic trash dumps eligible for the National Register of Historic Places. Unidentified grave sites may also be encountered during mining construction and operation. Four prehistoric lithic scatters and four other historic sites identified in the planning area not eligible for the National Register could also be affected by mining activities in the planning area (Section 4.2.10).

Indirect Impacts to Prehistoric and Historic Resources and the Hayden Hill Cemetery

Mining construction and operation may have an indirect impact on cultural resources by inducing the unauthorized collection of artifacts, and removal or vandalism of grave markers at the Hayden Hill Cemetery. The cemetery is presently fenced and would remain fenced during mining operations. Potential impacts to the cemetery from mining activities would not be significant (Section 4.2.10).

5.4.14.2 Mitigation Measures for Impacts on Cultural Resources

Direct and indirect impacts on cultural resources at Hayden Hill would be mitigated by compliance with the following regulations applied on a project-by-project basis: The California Environmental Quality Act, as amended, Section 21083.2; the CEQA Guidelines, Appendix K, Archaeological Impacts; the California Code of Regulations, Title 14, Division 6, Chapter 3; the National Historic Preservation Act of 1966, as amended, Section 106; and the Code of Federal Regulations, Title 36, Part 800, Protection of Historic and Cultural Properties.

No mitigation is required.

5.4.15 Visual Resources

5.4.15.1 Impacts on Visual Resources

Both short- and long-term adverse visual impacts would result from implementing the Resource Plan. The potential impacts of mining activities on visual resources would be similar to those for the proposed Project, as described in Section 4.2.11.2.

Views from Highway 139

The principal visual impact from Highway 139 would be to middleground views of mining activities in the planning area.

Views from Hayden Hill Road

Visual impacts from Hayden Hill Road would be less significant than those from Highway 139 due to its minimal use and low visual sensitivity.

Background Views from Outside the Planning Area

Minor, short-term visual impacts of distant background views from Adin and Little Gold Hill may occur during the initial stages of mining development.

5.4.15.2 Mitigation Measures for Impacts on Visual Resources

Successful implementation of the Reclamation Plan for the proposed Project would ultimately mitigate visual resource impacts in the planning area on the long-term. Visual impacts during mining operations would be short-term and less than significant.

Mitigation for Short- and Long-Term Visual Impacts from Highway 139 and the North

- Amend Scenic Resources Goal, Objective A, Policy 1 in the Conservation/Open Space Element to reduce short- and long-term visual impacts from Highway 139.

    - Policy 1-- Review development applications in the planning area to minimize adverse effects on existing scenic resources to the extent compatible with mining operations. Consider the impact of the development's appearance on the landscape in terms of height, massing, materials, color, and scale as part of the County's project review process. Also consider minimizing the elimination of vegetation as a visual buffer.

Mitigation for Long-Term Visual Impacts from the Intersection of Highway 139 and Hayden Hill Road

- Amend Transportation Goal, Objective A, Policy 4 in the Resource Plan Circulation Element to mitigate short-and long-term visual impacts from the intersection of Highway 139 and Hayden Hill Road.

    - Policy 4-- Evaluate any proposed improvements to the intersection of Hayden Hill Road and Highway 139 for traffic safety, as well as visual impact.

Mitigation for Short-Term Visual Impacts from Hayden Hill Road and Views South and West of the Planning Area

- Amend Scenic Resources Goal, Objective A, Policy 1 of the Conservation/Open Space Element to mitigate short-term visual impacts from Hayden Hill Road and views south and west of the planning area.

    - Policy 1-- Review development applications in the planning area to minimize adverse effects on existing scenic resources to the extent compatible with mining operations. Consider the impact of the development's appearance on the landscape in terms of height, massing, materials, color, and scale as part of the County's project review process. Also consider minimizing the elimination of vegetation as a visual buffer.

Mitigation for Implementing the Reclamation Plan

- Amend Mineral Resources Goal 2, Objective C, Policy 5 of the Mineral Resources Element to ensure that the Reclamation Plan addresses visual impacts.

  - Policy 5-- The Reclamation Plan for Hayden Hill shall address cultural, historic, ~~and~~ public recreation and scenic values.

Implementation of Scenic Resources Goal Objective A, Policy 1 would also mitigate potential visual resource impacts in the planning area. Policy 1 requires review of development applications for potential adverse effects on scenic resources.

5.4.16 Transportation

5.4.16.1 Impacts to Transportation

The expected traffic volumes from Resource Plan area land uses would not create a significant negative impact in terms of traffic volumes, congestion and level of service. Minor potential exists for road surface damage from heavy trucks traveling to and from the area.

5.4.16.2 Mitigation Measures for Impacts to Transportation

No mitigation measures are required.

5.4.17 Recreation

5.4.17.1 Impacts to Recreation

Implementation of the Resource Plan would have similar impacts on recreation to those identified for the proposed Project as described in Section 4.2.13.2.

Loss of Town Site and Mining District

Loss of the remains of the Hayden Hill town site due to mining operations would be an irreversible impact to this unique recreation opportunity in the planning area, depending on the location and extent of mining operations.

Reduced Quality of Recreation Activities

Noise, activity and the visual effects generated by proposed mining development would have a minor impact on the abundance and quality of hunting and bird watching activities in the immediate vicinity of the planning area, as described in Section 4.2.14. However, these activities are not unique to the planning area and can be accommodated throughout the region without a significant loss of recreational opportunity.

Competition for Willow Creek Camp Sites

Construction workers seeking temporary housing would compete with recreational users for camp sites at the USFS Willow Creek Campground near the planning area. This would have a potential short-term impact on the supply of camp sites for recreational purposes.

5.4.17.2 Mitigation Measures for Impacts to Recreation

Mitigation for Loss of the Hayden Hill Town Site and Mining District

- Add a new policy to Objective B of the Outdoor Recreation Goal in the Conservation/Open Space Element to address the loss of the Hayden Hill town site as a recreation impact.
  - Policy 4-- Encourage development of interpretive signs and markers for historic and modern mining practices in conjunction with mineral resource development.

Mitigation for Reduced Quality of Recreation Activities

No mitigation is required.

Mitigation for Competition for Willow Creek Camp Sites

Implementation of Objective B, Policy 1 in the Housing Element would partially mitigate temporary competition for camp sites at the Willow Creek Campground. Policy 1 requires completion of a housing impact analysis for mining projects in the planning area prior to development of any mineral resource activities.

- Add a new policy with the objective of preventing long-term use of Willow Creek Campground by construction workers:
  - Policy 3--Require that employers in the planning area actively discourage the residential use of Willow Creek Campground by employees as temporary housing.

5.4.18 Noise

5.4.18.1 Impacts to Noise

The Resource Plan allows noise levels up to the limits established by the Lassen County General Plan Noise Element. The existing noise environment surrounding the Hayden Hill Planning Area is very quiet. Because of the quietness, noise levels caused by a mining operation at Hayden Hill could meet the Resource Plan and General Plan guidelines and still cause a significant increase in noise levels in the surrounding areas. For instance, noise levels at the nearest sensitive land use, the Willow Creek Campground, could increase by 12 decibels (dBA) in the L50 descriptor and still meet the Noise Element guidelines. A 10 dBA increase is perceived as a doubling in loudness by most people. A 5 dBA increase is usually considered significant.

Lmax levels due to blasting could easily exceed Noise Element Guidelines at the campground if not carefully controlled. Blasting noises are an adverse impact, but the impact would be short-term, with blasting occurring up to twice a day for a duration of less than one second. Overall noise levels in the planning area would increase substantially. However, noise levels from any pit mining operation will decrease over time. As the pits become deeper, they act as noise barriers, blocking noise coming from drilling, blasting and loading operations.

For purposes of assessing potential noise impacts of the Resource Plan, the noise analysis of the proposed Hayden Hill Project in Section 3.14 was used. Although the analysis for the proposed Project was assumed to be the maximum case condition, it is possible that noise impacts, both to ambient noise and to blasting, could be greater than for the proposed Project. At the Resource Plan level, the increase in ambient noise levels could be considered a significant, unavoidable adverse impact.

5.4.18.2 Mitigation Measures for Impacts to Noise

At the Resource Plan level, there are no mitigation measures which are feasible to reduce the impacts of an increase in ambient noise levels. However, these potential impacts would be assessed on a project-specific basis as required by the Resource Plan. The exact noise levels caused by any mining operation would depend on the exact equipment used, the arrangement of that equipment on the site, the hours of operation, and the degree of noise mitigation incorporated into the design of the mining operation. The noise impacts generated by any mining activity are partially mitigated by the implementation of the goals, objectives and policies in the Resource Plan, which requires a detailed analysis of both ambient and blasting noise impacts of any particular mining operation. However, a potential significant unavoidable impact of mining in the Hayden Hill area would be an overall increase in noise levels in this very quiet area. The significance of noise impacts would be assessed on a project-specific basis pursuant to the

Resource Plan. If a significant unavoidable adverse impact due to noise were identified which could not be mitigated to a less than significant level, the County would balance any unavoidable significant noise impacts identified for a project with other Resource Plan goals to encourage development of mining activities as an economic development strategy. A Statement of Overriding Considerations could be adopted if the County made the finding that diversifying the economic base of the County was an overriding consideration in approving a project with significant unavoidable noise impacts.

5.4.19 Plan Alternatives

This EIR examines the potential environmental impacts of three alternatives to the proposed Resource Plan. The No Project Alternative would preserve existing cultural and biological values in the planning area. The second plan alternative is to reduce the scale of the mineral resources that would be extracted to half of that anticipated under the proposed Resource Plan either by extracting minerals at the rate assumed in the Resource Plan for half the time period, or by extracting mineral resources at half the rate for a longer time period. The third alternative is to target another area in the County for mineral resource development.

5.4.19.1 No Project–Preserve Cultural and Biological Values

The No Project Alternative assumes that current development policies would remain in effect. The Lassen County General Plan:1990 would continue to guide development on private lands in the planning area. Existing land uses of rangeland, timber, wildlife habitat, and recreation would continue under the General Plan land use designations of General Forest Environment, Grazing and Sagebrush Environment, and Prime Recreation Area.

The remains of the Hayden Hill historic town would exist. Although not well-marked, the BLM Hayden Hill Historic District would continue to attract occasional tourists. The General Plan targets Hayden Hill as an opportunity to develop a tourist attraction. Under the No Project Alternative, the potential for the site to be developed as a tourist attraction would be maintained. However, the town site is on both public and private lands and BLM and private landowners have not indicated plans to develop the site as a tourist attraction. Historic and pre-historic artifacts may be taken by souvenir-seekers, degrading the quality of the site as a cultural resource. The fire tower would also remain until determined to be unfit for use. The structure may be rehabilitated or replaced. Another fire tower in another location may be used instead.

Existing environmental conditions would continue. Disturbance due to previous mining activity, both around the mid-1800's and modern mining exploration, would remain. However, natural revegetation of the abandoned heap leach pad was substantial.

Since Hayden Hill is rich in mineral resources, mining interests would continue to consider and propose to develop the area. Without the Resource Plan, the County would not have policy guidelines to use in reviewing mining proposals, but rely solely on the Conditional Use Permit process.

5.4.19.2 Reduced Scale Mineral Extraction Alternative

The Reduced Scale Mineral Development Alternative assumes that the total tons of ore and waste rock proposed with implementation of the Resource Plan, the maximum-impact condition, would be decreased by 50 percent. If the scope of the Project was reduced by 50 percent, the reduction in ore and waste rock volumes mined would reduce the approximate Project life from 8 years to 4 years. Although the overall size of the Project would be reduced, personnel requirements would probably remain approximately the same since similar facilities would be required for mining, processing, and recovering gold from the ore.

Under the Reduced Scale Mineral Development Alternative, the Project size would disturb slightly less land than the Proposed Action. This acreage reduction would be primarily due to elimination of portions of the pit, a reduced waste rock dump area, and elimination of some of the heap leach pad and tailings impoundment areas. Project facilities and mine equipment requirements would remain the same as for the Proposed Action.

Because the Project capacity and rate of production would not change with this alternative, ancillary facilities would not be reduced in size or capacity. Total consumption, however, would be about one-half of that required for the Proposed Action as less ore would be processed and the time of operation would be shortened.

Shortened mine life would result in decreased environmental effects in the Hayden Hill area due to slight decreases in the amount of disturbed acreage, slightly decreased demand on natural resources including minerals, water, and power, decreased traffic and noise impacts to wildlife, and slightly reduced visual impacts.

This alternative would also reduce the positive benefit to Lassen County's economic base. Although this alternative is the environmentally superior alternative, a Reduced Scale Mineral Extraction alternative would be economically infeasible, because the reduced gold production would be insufficient to pay back exploration and acquisition costs, and the capital investment would not produce as great a return. Should mine life be extended to the full ten years, but under a reduced mining rate, a somewhat smaller capital investment would be required. However, mining at the reduced rate would reduce economies of scale both in mining and milling the ore. In either case, the economic feasibility of the Project would be severely impaired (Outerbridge 1991).

5.4.19.3 Alternative Location

Under this alternative, a different area in the County would be selected for development of mineral resources, specifically gold and precious metals. The location of mining is limited to the location of the mineral resources. With adoption of the Resource Plan, Hayden Hill would be the only Significant Mineral Resource Area designated in the General Plan, although there are provisions for mining in several land use designations subject to a Conditional Use Permit. To compare the potential environmental impacts of mining in another location in the County, an area would have to be identified which is of interest to the mining industry. Each location would have unique environmental opportunities and constraints associated with development of mineral resources. However, no other areas are currently proposed for mineral resource development.

5.4.20 Significant Environmental Impacts

Table 5.4-1, Impact and Mitigation Summary--Hayden Hill Resource Plan, provides a summary of the environmental impacts and mitigation measures for the Hayden Hill Resource Plan. This summary assumes that all of the policies in the Resource Plan are implemented. For mitigation monitoring purposes, Lassen County is the agency responsible for addressing all of the mitigation measures identified, which involve amending the Draft Resource Plan. The mitigation measures would be incorporated into the Draft Plan to create a final Resource Plan for adoption.

5.4.21 Significant Unavoidable Environmental Effects

The potential increase in ambient noise levels in the planning area would represent a significant unavoidable impact. With implementation of the mitigation measures identified in Sections 5.4.2 through 5.4.18, implementation of the Hayden Hill Resource Plan would not create any additional significant unavoidable environment effects.

5.4.22 Relationship Between Local Short-Term Uses and Long-Term Productivity

For proposed planning documents and general plan amendments, CEQA requires that the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity be addressed in the EIR on the action. The Hayden Hill Resource Plan provides for maintaining the existing land use of the planning area for rangeland, timber, wildlife habitat, and recreation on the long-term. Mining activities would take place as a short-term land use over an estimated 10-year period to extract the mineral resources.

TABLE 5.4-1

IMPACT AND MITIGATION SUMMARY--HAYDEN HILL RESOURCE PLAN

Note: Additions to the plan are indicated by CAPITALIZATION. Deletions are indicated {in parentheses}.

Potential Impact	Mitigation
Topography and Grading	
Removal of ore	No mitigation is required.
Removal of soil and rocks to obtain ore	Add a new policy to the Mineral Resources Goal 2, Objective B, Mine Development and Operation Policies o POLICY 4: LASSEN COUNTY SHALL REQUIRE SUBMITTAL AND IMPLEMENTATION OF A PROJECT- SPECIFIC GRADING PLAN PURSUANT TO SMARA TO ADDRESS GRADING AND EROSION CONTROL FOR MINING OPERATIONS.
Increased erosion potential	Add a policy to Mineral Resources Goal 2, Ojective C, Reclamation Policies o POLICY 7: AN EROSION CONTROL PLAN SHALL BE SUBMITTED TO THE APPROPRIATE JURISDICTIONAL AGENCY FOR REVIEW AND APPROVAL BEFORE RECLAMATION ACTIVITIES COMMENCE AND SHALL BE IMPLEMENTED.
	Add a policy to Mineral Resources Goal 2, Objective B, Mine Development and Operation Policies o POLICY 5: AN EROSION CONTROL PLAN SHALL BE SUBMITTED TO THE APPROPRIATE JURISDICTIONAL AGENCY FOR REVIEW AND APPROVAL BEFORE MINING ACTIVITIES COMMENCE AND SHALL BE IMPLEMENTED.
Vegetation and Wetlands	
Loss of some timber stands and grazing lands	No mitigation is required.
Loss of plant communities, including the potential for permanent loss of Low Sagebrush habitat	Add the following Objectives and Policies to Biological Resources Goal 1: o OBJECTIVE C: ANY MINING ACTIVITY SHOULD BE ACCOMPANIED BY A RECLAMATION PLAN THAT MINIMIZES IMPACTS TO BIOLOGICAL RESOURCES OF THE PLANNING AREA. o POLICY 1: LASSEN COUNTY AND/OR THE CALIFORNIA DIVISION OF MINES AND GEOLOGY (DMG) WILL EXERCISE ITS AUTHORITY TO PARTICIPATE IN THE SMARA REGULATORY PROCESS IN RELATION TO RECLAMATION OF NATIVE VEGETATION COMMUNITIES DISTURBED BY MINING PROCESSES.

Potential Impact	Mitigation
	o POLICY 2: LASSEN COUNTY AND/OR DMG WILL CONSULT WITH BIOLOGISTS OR RESOURCE MANAGERS FROM THE USFS, BLM, AND CDFG DURING ITS REVIEW OF MINING RECLAMATION PLANS, AND CONSIDER THEIR COMMENTS AND CONCERNS BEFORE APPROVING THE RECLAMATION PLAN. o POLICY 3: LASSEN COUNTY AND/OR DMG WILL ONLY APPROVE RECLAMATION PLANS THAT ENCOURAGE REVEGETATION OF DISTURBED AREAS TO THE EXTENT FEASIBLE, AND WILL ENCOURAGE REVEGETATION WITH NATIVE VEGETATION SIMILAR TO EXISTING VEGETATION, UNLESS THIS IS INFEASIBLE DUE TO EXCESSIVE SLOPE OR PERMANENTLY ALTERED SOIL CONDITIONS.
Loss of wetlands	Change Biological Resources Goal 2 to read: o To provide protective measures for riparian corridors along selected streams AND WETLANDS WITHIN THE PLANNING AREA, which balance the need for grazing, recreation, timber and mining operations, WILDLIFE, and flood control with preservation of riparian AND WETLAND values. Change Objective B of this goal to read: o Encourage land use practices that minimize impacts to native plant species to the extent feasible within riparian corridors AND WETLANDS. Change Policies 1 and 2 for Objective B to include wetlands, and add a new Policy 4 to specify mitigation procedures for impacted wetlands: o Policy 1—As part of land use permitting, encourage revegetation with native species in areas that are temporarily disturbed in riparian corridors AND WETLANDS during development. o Policy 2—Encourage private and public projects to minimize encroachment on ripariain corridors AND WETLANDS. o POLICY 3—REQUIREMENTS FOR THE CONDITIONAL USE PERMIT SHOULD INCLUDE THE REPLACEMENT OF ALL IMPACTED WETLANDS AT A RATIO OF AT LEAST 1:1 EITHER ON-SITE OR OFF-SITE, OR A WETLANDS REPLACEMENT PLAN THAT THE COUNTY APPROVES AFTER CONSULTATION WITH BIOLOGISTS, WARDENS, OR RESOURCE MANAGERS FROM THE COE, USFS, BLM, AND USFWS FOR FEDERALLY OWNED LANDS, OR FROM THE COE AND CALIFORNIA DEPARTMENT OF FISH AND GAME (CDFG) FOR PRIVATELY OWNED LANDS.
Potential loss of *Antennaria flagellaris* a special-status plant species	No mitigation is required.

Potential Impact	Mitigation
Wildlife and Aquatic Biology	
Potential loss of wildlife habitat from loss of plant communities	Change Policy 4 of Objective A of Biological Resources Goal 1 to read: o When critical habitats are subject to significant environmental impacts, A HABITAT MANAGEMENT PLAN MUST BE PREPARED WHICH DESCRIBES MITIGATION MEASURES TO BE UNDERTAKEN THAT INVOLVES EITHER ON-SITE OR off-site compensation {shall be considered} with the objective of providing no less than equivalent habitats.
Potential impacts to wildlife due to noise from mining activities	Potential noise impacts due to mining activities on the behavior, reproduction, and survival of domesticated and wild animals in the project area would be less-than-significant.
Potential for contaminated runoff from mining operations to enter streams	Mitigation in Water Resources Section.
Water Resources	
Potential for Acid Rock Drainage or drainage of other contaminants into surface waters	Change Policy 1 under Objective A of the Water Resources and Water Quality Goal to read: o Protect watershed and groundwater recharge areas by managing the placement of potential pollution sources and by complying with all applicable state and federal groundwater protection requirements, INCLUDING THOSE LISTED IN THE CALIFORNIA CODE OF REGULATIONS, TITLE 23, CHAPTER 15, ARTICLE 7 (MINING, WASTE MANAGEMENT), AND THE CALIFORNIA PORTER-COLOGNE WATER QUALITY ACT OF 1985.
Potential for drainage of contaminants into groundwaters	No mitigation is required with the changes made to Policy 1 above.
Air Quality	
Potential increase in airborne particulate matter (PM10)	No mitigation is required beyond compliance with the Resource Plan, the California Health and Safety Code, Division 26, Part 2, State Air Resources Board, Chapter 3, and Lassen County Air Pollution Control Regulations Rule 4.
Potential for low-level hydrogen cyanide emissions	No mitigation is required beyond compliance with the Resource Plan, the California Health and Safety Code, Division 26, Part 2, State Air Resources Board, Chapter 3, and Lassen County Air Pollution Control Regulations Rule 4.
Employment	
Increased employment opportunities	Beneficial impact—no mitigation required.

Potential Impact	Mitigation
Population	
Potential population growth may generate housing demand and demand for public services	Mitigation in Local Government Facilities and Services Section.
Housing	
Increased housing demand	No mitigation is required beyond implementation of the Lassen County General Plan Housing Element and Susanville Area Plan.
Short-term construction worker housing demand	No mitigation is required beyond implementation of the Lassen County General Plan Housing Element and the Resource Plan Housing Element.
Indirect impacts of potential for creating a "boom and bust" housing market	No mitigation is required beyond implementation of the Lassen County General Plan Housing Element.
Education	
Increased school district operating costs	Add a new education goal, objective and supporting policy in the Resource Plan Housing Element as follows: o EDUCATION GOAL: TO PROVIDE PRESENT AND FUTURE RESIDENTS OF THE COUNTY WITH ADEQUATE SCHOOL FACILITIES AND SERVICES TO MEET PROJECTED POPULATION GROWTH OF SCHOOL-AGE CHILDREN. o OBJECTIVE A. THE SCHOOL DISTRICTS SHOULD EVALUATE ALTERNATIVE FINANCING SOURCES TO FUND NECESSARY SCHOOL DISTRICT IMPROVEMENTS. o POLICY 1—THE AFFECTED SCHOOL DISTRICTS SHOULD CONSIDER DEVELOPING A SCHOOL IMPACT FEE PROGRAM FOR ALL NEW COMMERCIAL AND INDUSTRIAL DEVELOPMENT IN SCHOOL DISTRICTS WITH CAPACITY CONSTRAINTS.
Local Government Facilities and Services	
Potential sewer service demand may exacerbate current infiltration problems	No mitigation required.
Need for funds for additional law enforcement personnel	Amend Emergency Preparedness Goal Policy 2 in the Safety Element to read: o POLICY 2—Determine the structural, equipment, and personnel needs to provide emergency services to the planning area, AND REQUIRE THAT PROJECT SPONSORS PROVIDE ADEQUATE PRIVATE SERVICES TO MEET PROJECT LAW ENFORCEMENT, FIRE PROTECTION, AND EMERGENCY MEDICAL SERVICE NEEDS.

Potential Impact	Mitigation
Need for additional fire protection staff and/or equipment	The proposed changes to the Emergency Preparedness Goal Policy 2 will mitigate for the impact.
Need for additional health service staff	The proposed changes to the Emergency Preparedness Goal Policy 2 will mitigate for the impact.
Potential need for hazardous waste disposal	No mitigation is required.
Land Use Impacts	
Consistency with County, State and Federal Plans	No mitigation is required.
Short-term displacement of land uses	Add a policy to the Land Use Goal 1, Objective C: o POLICY 3—PROJECT SPONSORS SHOULD MINIMIZE THE SHORT-TERM LOSS OF RANGELAND AND TIMBER BY COMPLYING WITH BLM AND/OR OTHER AGENCIES REGARDING MANAGEMENT OF GRAZING ALLOTMENTS AND COMMERCIAL TIMBER SALES DURING MINING ACTIVITIES ON PUBLIC AND PRIVATE LAND.
Potential existing and future land use conflicts	No mitigation is required.
Cultural Resources	
Removal of Hayden Hill Townsite and Fire Tower, and potential disturbance of other prehistoric and historic sites, including unidentified graves	No mitigation is required beyond compliance with the California Environmental Quality Act (CEQA), as amended, Section 21083.2, the CEQA Guidelines, Appendix K, Archaeological Impacts, the California Code of Regulations, Title 14, Division 6, Chapter 3, the National Historic Preservation Act of 1966, as amended, Section 106, and the Code of Federal Regulations, Title 36, Part 800, Protection of Historic and Cultural Properties.
Induce unauthorized collection or vandalism of artifacts at Hayden Hill cemetary	No mitigation is required beyond compliance with the California Environmental Quality Act (CEQA), as amended, Section 21083.2, the CEQA Guidelines, Appendix K, Archaeological Impacts, the California Code of Regulations, Title 14, Division 6, Chapter 3, the National Historic Preservation Act of 1966, as amended, Section 106, and the Code of Federal Regulations, Title 36, Part 800, Protection of Historic and Cultural Properties.
Visual Resources	
Views of mining from Highway 139	Amend Scenic Resources Goal, Objective A, Policy 1 to read: o POLICY 1—Review development applications in the planning area to minimize adverse effects on existing scenic resources to the extent compatible with mining operations. Consider the impact of the development's appearance on the landscape in terms of height, massing, materials, COLOR, and scale as part of the County's project review process. ALSO CONSIDER MINIMIZING THE ELIMINATION OF VEGETATION AS A VISUAL BUFFER.

Potential Impact	Mitigation
Views of mining from Hayden Hill Road	Amend the Transportation Goal, Objective A, Policy 4 to read: o POLICY 4—Evaluate any proposed improvements to the intersection of Hayden Hill Road and Highway 139 for traffic safety, AS WELL AS VISUAL IMPACT.
Views of mining from outside the planning area	The amendment to Scenic Resources Goal, Objective A, Policy 4 will mitigate for this impact.
Views of reclamation activities	Amend Mineral Resources Goal 2, Objective C, Policy 5 to read: o POLICY 5—The Reclamation Plan for Hayden Hill shall address cultural, historic, {and} public recreation AND SCENIC values.

Transportation

Minor road surface damage from trucks	No mitigation is required.

Recreation

Loss of historic town site and mining district	Add Policy 4 to Objective B of the Outdoor Recreation Goal: o ENCOURAGE DEVELOPMENT OF INTERPRETIVE SIGNS AND MARKERS FOR HISTORIC AND MODERN MINING PRACTICES IN CONJUNCTION WITH MINERAL RESOURCE DEVELOPMENT.
Reduced quality of recreational activities	No mitigation is required.
Competition for Willow Creek campsites	Add a new policy with the objective of preventing long-term use of Willow Creek Campground by construction workers: o POLICY 3—REQUIRE THAT EMPLOYERS IN THE PLANNING AREA ACTIVELY DISCOURAGE THE RESIDENTIAL USE OF WILLOW CREEK CAMPGROUND BY EMPLOYEES AS TEMPORARY HOUSING.

Noise

Potential for increased noise due to blasting and overall noise increases	Mitigation for noise impacts could be applied on a project-specific basis. Significant unavoidable impacts to the increase in ambient noise levels cannot be mitigated at the Resource Plan level.

The goals, objectives and policies of the Resource Plan are designed to minimize the environmental impacts of implementing the plan and to protect the natural resources, both in the long-term and during mineral extraction. Productivity of land in the planning area for grazing and timber would be impacted in the short-term. Without implementation of Resource Plan goals, objectives and policies and the mitigation measures identified in this EIR, mining activities would be detrimental to the long-term productivity and land uses in the planning area. However, with implementation of the Resource Plan plus mitigation measures identified in the EIR such as erosion control plans, reclamation plans, and grading plans, the long-term land use and productivity in the planning area would not be threatened significantly. Mitigation measures would also eliminate long-term risks to public health or safety which may result from mining activities.

Reclamation of the Jeffrey Pine/Mountain Shrub area for feasible timber harvest may not be feasible for an extended time period. Any impact to that plant community could limit the long-term productivity for timber and wildlife habitat. Reclamation plantings would mitigate for short-term potential losses of vegetative cover of large areas of Jeffrey Pine/Mountain Shrub and Low Sagebrush vegetation. However, potential impacts to wildlife habitat in these areas could be significant. However, over 900 acres of Jeffrey Pine/Mountain Shrub habitat exist in the planning area, and thousands of acres of timber lands exist adjacent to the planning area in the Modoc National Forest. As a result, in a regional, County-wide perspective, the long-term productivity for timber resources would not be significantly impacted by implementation of the Resource Plan. Grazing resources in the planning area would be temporarily impacted by mining operations. Reclamation for grazing land uses is expected to be highly successful, so that implementation of the Resource Plan would not decrease the long-term productivity of the planning area for grazing.

The CEQA guidelines also require the reason that the action is being taken now instead of reserving an option for further alternatives should be explained. The purpose of the Hayden Hill Resource Plan is to encourage development of the mineral resources at Hayden Hill, including gold, silver and precious metals. Mining and extraction of mineral resources is essential to the needs of society and contributes to the economic base of the County. Lassen County is considering the Resource Plan at this time to respond to a proposal to develop a gold and silver mine at Hayden Hill.

5.4.23 Significant Irreversible Changes if the Resource Plan is Implemented

The California Environmental Quality Act requires that for proposed plans or general plan amendments, the EIR should address any significant irreversible environmental changes which would be involved in the proposed plan should it be implemented. Development of mineral resources would commit land in the planning area for resource development on the short-term. However, this commitment is not an irreversible commitment, since most of the land would be reclaimed after an estimated 10-year period.

Land would revert to grazing, timber, wildlife habitat and recreation uses. Impacts to geology, soils, vegetation, wildlife, water resources, air quality, visual resources, and noise would also occur during mining activities. Since land uses would be restored following mining of resources and a reclamation plan would be implemented, these changes would not be irreversible.

However, Hayden Hill as a geologic feature may be irreversibly altered since soil and rock must be removed to mine the ore and substantial grading could occur. This change could cause irreversible changes in the visual quality of Hayden Hill and the planning area. Duripan soil where the Low Sagebrush habitat exists could be lost. Grading practices could cause erosion to occur in Willow Creek and negatively impact water quality due to increased sedimentation. These impacts to Willow Creek could in turn negatively impact Modoc sucker habitat. Irreversible changes could occur to timber resources in the Jeffrey pine and Low sagebrush areas within any mining area. An irreversible commitment of non-renewable energy resources for fuel for vehicles and mining equipment during construction and operations would be made. However, these potential changes which may be irreversible are not anticipated to be significant. Resource Plan goals, policies and objectives, plus mitigation measures in the plan EIR would be implemented.

5.4.24 Growth Inducing Impacts

The CEQA Guidelines require that an EIR evaluate the growth-inducing impact of a proposed project. Section 15126 (g) of the CEQA Guidelines defines growth inducing as:

> "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment."

Included in this definition are projects that may remove obstacles to population growth. The environmental effects of this growth are considered to be the secondary, or indirect impacts of the proposed Project.

Implementation of the Hayden Hill Resource Plan would induce growth. However, the major goal of the Resource Plan is to foster beneficial economic development in the mining industry. Growth would be encouraged through the following parameters:

- Employment (both direct and indirect);
- Population;
- Housing; and
- Public services and infrastructure.

Development of mineral resources in the planning area could potentially create up to 200 full time jobs during mining operations. About half of these new jobs would be filled by new residents, and half by the local labor pool. Indirect job opportunities in the service industry would create up to 80 jobs. Resource Plan implementation would stimulate a growth in population of up to 350 people during mining activities, about a 1.3 percent increase in the County population. The increase in population could cause an increase in housing. As construction increases to meet housing demand, a housing development boom may result. After the mining activities are over, the vacancy rate may be higher than desirable when some of the non-resident mining employees leave the region.

Public services and infrastructure might be upgraded in response to the mining-induced population and housing growth. The Resource Plan recommends analyses for sewer service, school facilities, law enforcement, fire service, and health service needs, in response to increased demand caused by the mineral resource development activity.

The Hayden Hill Resource Plan is the first Resource Plan to be proposed in the County. If adopted and successfully implemented, this may encourage the mining industry to seek other areas in Lassen County rich in mineral resources for development.

5.4.25 Cumulative Impacts

Section 15355 (b) of the CEQA Guidelines defines cumulative impacts in part as:

> "the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects".

A cumulative impact analysis has two dimensions; cumulative impacts of projects in the planning area and vicinity, and cumulative impacts due to induced growth. Lassen County is not considering any new plans or policies for land in the vicinity of the planning area. Additional proposed projects for land in the vicinity of the planning area are not foreseen at this time, although improvements to the intersection of Hayden Hill Road and Highway 139 may occur in conjunction with a mining project. It is also unlikely that a mine would be developed in the vicinity of the planning area, since appropriate mineral resources have not been identified. As a result, cumulative impacts due to mining activities in close proximity would probably not occur. Subsequently, there would probably be no direct short-term construction or long-term growth inducing cumulative impacts in the immediate vicinity of the planning area. Cumulative impacts in the vicinity of the planning area would be assessed at the project-specific level as part of an EIR when a mining development is proposed.

There could be cumulative impacts due to induced growth on a regional level, depending on the timing of development of mineral resources at Hayden Hill. There are three proposed projects which, in combination with the Hayden Hill Resource Plan could have a cumulative impact:

- California Correction Center Expansion--The California Correction Center, located in Susanville, is the County's largest government employer. The proposed expansion would be the most significant contribution to cumulative impacts. Construction is currently scheduled to begin in February of 1992, with completion in the fall of 1993. When completed, the Center would add an estimated 500 construction jobs, 965 new direct jobs, 482 indirect jobs, a population increase of approximately 2,316 people, increase in school enrollment of 710 students, and demand for 724 new housing units (Parks 1990). The EIR for the Correction Center expansion is in progress.

- Declining Timber Industry--Although the timber and wood products industry in Lassen County is projected to remain stable, this industry in Modoc and Shasta Counties is anticipated to experience a slow-down. It can be anticipated that unemployed timber industry workers and their families would eventually leave the area if no new jobs are available to replace lost jobs.

- Sierra Army Depot Expansion--The Sierra Army Depot, located in Herlong, is expected to lose 45 employees in October 1990, but add 80 to 100 personnel, for a total of 35 to 55 new employees over the next several years. An accompanying population increase of 70 to 190 is anticipated.

- Proposed Biological Waste Incinerator--A bio-waste incinerator is proposed to be located next to the playing fields at the community college in Susanville. A Draft EIR was prepared for the project. However, the public comment period was not completed because the project sponsor withdrew County applications. The Project sponsors may pursue their proposal at the State level, since as a State agency, the college district may be exempt from local land use regulations.

The key factor in assessing the environmental impacts of cumulative induced growth is the timing of mineral development at Hayden Hill in relationship to these other projects. This would be evaluated in the cumulative impact analysis for a future mineral development projects. Potential cumulative impacts of growth will be addressed in the California Correction Center Draft EIR. The Bio-Waste Incinerator project EIR also addresses cumulative impacts. Timber industry changes are not a proposed project, and would not be subject to environmental review.

The potential cumulative growth inducing impacts for implementation of the Hayden Hill Resource Plan would be similar to those identified for the proposed Project in Section 4.1.4. In summary, these include:

- Increased demand for both high- and low-density residential development in Susanville and other communities in southern Lassen County.

- Potential increased housing supply in rural communities in Lassen and Modoc counties, outside of Susanville, which may not have the public infrastructure and services to support significant new housing and population growth. This could create excess housing supply when mining employees leave the area after mining operations are complete.

- Increased demand on public services in these communities, including law enforcement, fire protection, schools, recreation facilities, recreation programs, and maintenance of public facilities.

Another measure of potential cumulative impacts is found in the Susanville General Plan and EIR. The majority of cumulative impacts would occur in the City of Susanville, since the majority of the new population would locate in this city. The EIR on the City of Susanville General Plan documents the potential cumulative environmental impacts associated with buildout of the City to the year 2010. Since the projects identified for purposes of cumulative impact analysis account for only a part of the buildout of the Susanville General Plan, the same type of cumulative impacts would apply as identified in the General Plan EIR, but on a lesser scale. Similar cumulative impacts due to induced growth may also occur in the communities of Adin, Bieber and Alturas. The following list of cumulative impacts is based on the potential environmental impacts identified in the Susanville General Plan EIR for buildout of the City to the year 2010.

- Land use impacts due to: Additional housing units; commercial, office and industrial building development; and locational patterns of housing;

- Increased traffic volumes, congestion, and accidents;

- Increased demand for housing and construction of housing;

- Increased demand for public services;

- Demand for new utilities, including electricity, telephone, water service, and sewage treatment capacity;

- Noise level increases associated with added traffic and greater use of the Susanville Airport;
- Increased energy consumption;
- Soil and slope disturbance and changes in drainage patterns caused by alteration of slopes and increases in impermeable surfaces;
- Water quality impacts due to runoff, altering land forms, changing drainage patterns, and increasing impervious surfaces;
- Effects on air quality caused by traffic and potential increased use of wood stoves and fireplaces;
- Community character could be changed due to increasing size of the City, impacts on views, reducing the importance of the central commercial area, replacing historic buildings with new structures, and diminishing the character and importance of the Susan River and Piute Creek in Susanville and waterways in other communities;
- Pressures on parks and recreation programs and facilities;
- Known archaeological sites could be exposed to risk of disturbance and vandalism due to new development;
- Increased demands on social service and health care delivery systems;
- Increase in the number of people and number of buildings potentially exposed to fire, crime, natural hazards and hazardous materials; and
- Demands on water supply.

There would also be increased employment opportunities and more revenue to be spent in local retail centers, which are considered positive impacts. Beneficial impacts could also result from building a network of open spaces, access to natural areas, and the ability to travel along open space corridors to reach destinations, which is proposed in the Susanville General Plan.

CHAPTER 6.0
CONSULTATION AND COORDINATION

6.0 CONSULTATION AND COORDINATION

The following chapter has been prepared as recommended in the National Environmental Policy Act (NEPA) Handbook, Chapter V, Preparing Environmental Impact Statements. The scoping process including public and agency involvement, will be described. The results of scoping and the use of comments in the Environmental Impact Report/Environmental Impact Statement (EIR/EIS) process are summarized. Coordination and Consultation efforts with agencies are also described. Appendix J contains the list of Agencies, Organizations, and Persons to Whom Copies of the Statement are Sent.

6.1 Scoping

6.1.1 Public Scoping

Public scoping is required under both NEPA and the California Environmental Quality Act (CEQA) regulations. The efforts to involve the public in the EIR/EIS preparation were by various printed notices, meetings, and by direct mail. The Lassen County Planning Department and the Bureau of Land Management (BLM) as the lead agencies for this EIR/EIS preparation have conducted the Public Notifications discussed below.

Public scoping meetings were held on November 16, 1989 in Susanville and a public workshop was held on November 30, 1989 in Adin, to solicit input from interested individuals, groups, agencies, and elected officials. Notices for the meetings were published in the Lassen County Times and the Mountain Echo on November 7, 1989 and the Modoc County Record on November 9, 1989. These meetings were also announced by direct mailing of notices to concerned agencies, organizations, and property owners in the vicinity of the Project between October 27 and November 7, 1989. Items or issues to be addressed as part of the EIR/EIS were compiled from oral and written statements. Copies of public scoping notifications are included in Appendix A. A Notice of Intent (NOI) was published in the Federal Register by the BLM on November 6, 1989 and by the United States Forest Service (USFS) on November 2, 1989.

6.1.2 Interagency Scoping

Lassen County, the BLM, USFS, and the Project Applicant (LGMI) have solicited input from interested parties and individuals throughout the Project planning and scoping process. Interagency scoping meetings for the Hayden Hill Project were held on February 9, 1990 in Susanville and on March 20, 1990 in Alturas at the BLM office. At the first meeting, all members of the Joint Steering Committee were present. The Joint Steering Committee, the Applicant, the third party document preparer, agency and subcontractor resource specialists, attended the second meeting.

A Final Scoping Document dated April 27, 1990, identified major Issues, Concerns, and Opportunities (ICOs) and initial alternatives based upon written and oral comments received in response to the public and agency scoping sessions described above. Agency responses to the NOI to prepare an EIR/EIS for the Project provided background information on existing resources and indicated concerns regarding alternative development, impact assessment, mitigation, site monitoring, and reclamation planning.

6.1.3 Results of Scoping

The Notice of Preparation (NOP), NOI, public notifications, and public meetings resulted in 38 comment letters or statements being received on the Project between November 1989 and January 1990. Copies of the 38 comment letters received throughout the scoping period are available for review at the Lassen County Planning Department. After carefully considering all of the public comments received in response to the public notices and interagency scoping meetings, the EIR/EIS team identified a list of Issues, Concerns and Opportunities which are summarized in Table 6.1-1. This list also incorporates comments received from the BLM, USFS, and other agencies responding to the NOP/NOI or reviewing the Plan of Operations (POO).

The comments were used to identify public issues, agency concerns, and to expand the scope of work. Areas of concern identified as needing more detailed or intensive study were: wetlands, water supply and drawdown, aquatic biology, geochemical properties of the waste rock, visual impacts, watershed analysis, and air quality. Many of these concerns were identified through the Joint Steering Committee meetings, involving various agencies. As the Project became more clearly understood and outlined, questions were raised, and the scope of work was expanded to accommodate the appropriate data collection and analysis to answer the questions.

6.2 Coordination

Agency, Applicant, and third party preparer coordination was accomplished through the Joint Steering Committee, as described in Chapter 1.0. The Steering Committee held meetings monthly to discuss progress on the EIR/EIS, to make decisions on document content, to decide on how to proceed with issues raised, work scope expansion, and the level of study required to respond to concerns.

In addition to the Joint Steering Committee, Interdisciplinary (ID) teams were formed to develop and facilitate communication between resource specialists for the BLM, USFS, Lassen County, Lassen Gold Mining, Inc. (LGMI), and Steffen Robertson and Kirsten (U.S.), Inc. (SRK) on the development of the EIR/EIS. The ID team is comprised of separate task groups for each resource area. The task groups are made up of the specialists responsible for making recommendations to their respective agency managers.

TABLE 6.1-1
SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

Issues Listed by Resource Area	Number of Comments Received*
Cumulative Impacts	1
• What would be the cumulative effects of the Project?	
Proposed Action and Alternatives	13
Issues and Concerns related to mining operations and alternative design follow:	
• What consideration of other gold extraction methods has been done?	
• Will a monitoring plan be completed and compliance be required?	
• How will cyanide handling, storage, use and control be accomplished?	
• Will emergency mitigation and planning be done?	
• Will adequate alternative development including alternatives for the power line corridor and access be done?	
• What are the land management objectives for post mining use?	
Issues and concerns pertaining to building a new fire lookout tower are listed below:	
• Does the new tower location best suit fire lookout needs?	
• Is the new lookout located so that it will have minimum impact on the environment?	
Geology and Topography	
• What hydrologic (peak event basis) and geotechnical practices will be used in project design?	
• Are there any known geologic hazards in the areas of influence?	
Soils	8
• Will there be a soil salvage plan and if so what will it entail?	
• How will erosion control be achieved at the site?	

* Number of Comments Received from the 38 scoping letters.

TABLE 6.1-1 (continued) SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

Issues Listed by Resource Area	Number of Comments Received*
Vegetation	**13**

Issues and concerns related to vegetation, wetlands, reclamation and long term productivity are listed below:

- What vegetational resource values are present and how will they be protected?
- Will water courses, riparian areas, and wetland areas be delineated, and will adequate mitigation measures and compensation be developed?
- What old growth forest areas exist at the site?
- Will the Project affect any protected State or Federal plant species?
- What are the reclamation objectives for the areas of influence?
- How will the Project components be reclaimed and waste material be managed following Project completion?
- Will the reclamation bond be adequate to cover reclamation and long term monitoring?
- Will soil mapping, re-vegetation trials, and site specific erosion control measures be carried out to evaluate project impacts and develop the reclamation plan?
- How will re-vegetation success be monitored?

Issues Listed by Resource Area	Number of Comments Received*
Wildlife and Aquatic Biology	**22**

- What mitigation measures will be implemented to prevent wildlife mortality due to cyanide/mine processing residue contamination?
- Which species/habitats could be adversely affected by the Project and what specific facilities could affect them?
- Will the Project adversely affect any State and/or Federally listed threatened or endangered fish and wildlife species or their habitats?
- How will the Project affect wildlife management in the areas of influence? (State wildlife refuge, wildlife management areas on private land, and Willow Creek)
- How will wildlife be affected by increased traffic to and within the Project area?
- What mitigation measures will be implemented to mitigate habitat losses and impacts?

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* Number of Comments Received from the 38 scoping letters.

TABLE 6.1-1 (continued) SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

Issues Listed by Resource Area	Number of Comments Received*
Water Resources	18
• What are the impacts to surface and groundwater quantity and quality?	
• What are the Project water supply requirements?	
• When and how will water resources be monitored, for quality and quantity, throughout Project life?	
• What will the waste discharge requirements be for the Project?	
• What is the status of the Project water rights?	
Air Quality	4
• How will air quality in the Project vicinity be affected by Project activities?	
• What will the quantity of emissions be?	
• Could acid rain be a by-product of cyanide solution evaporation at Hayden Hill?	
• Is cyanide drift during strong wind conditions a potential impact to water quality?	
Socioeconomics	13
• What will be the economic benefits of the Proposed Action to the area of influence?	
• What will be the impacts to the existing infrastructure of the area of influence?	
• What will be the impacts to housing in the area of influence?	
• What will be the impacts to property values due to the Proposed Action?	
Land Use	7
• Are the existing Land Use designations compatible with the Proposed Action?	
• What will be the impacts to livestock grazing and lease agreements?	
• What will be the impacts to future land uses?	

* Number of Comments Received from the 38 scoping letters.

TABLE 6.1-1 (continued) SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

Issues Listed by Resource Area	Number of Comments Received*
Cultural Resources	7
• How will historical and archaeological sites in the Project area be affected and/or protected?	
• What will be done regarding the presence of graves which lie outside of the cemetery?	
Visual	1
• What are the visual resource values in the Project influence area?	
• How will the visual resource values be affected?	
Transportation	5
• What will be the impacts to Public safety due to the Proposed action?	
• What will be the impacts due to hazardous substance transport in the area of influence?	
• What conflicts with other users, such as loggers and ranchers, will be manifest on existing roads due to the Proposed Action?	
Recreation	2
• What will be the impacts to the existing recreation in the area?	
Noise	1
• What are the impacts to the existing area of influence?	
• What are the impacts to wildlife?	
Fire Tower Alternative	
• Will the new location of the existing fire tower serve to educate and inform the public?	
• Will the new location of the existing fire tower provide for maintenance expenses?	

* Number of Comments Received from the 38 scoping letters.

The responsibilities of the ID team members, as outlined by the lead, are to ensure that the document meets agency standards and is technically adequate for publication. The ID team listed a responsible person to review each resource area, and to assemble a task group if necessary. As sections were completed for each resource area they were sent to the task group for review.

The task group reviewing wildlife and aquatic biology was the largest of the ID teams. Due to the size of this task group, meetings proved to be the most efficient way to facilitate communication between the wildlife biologists for three BLM offices, the USFS, the California Department of Fish and Game (CDFG), SRK, and LGMI. Lassen Gold Mining, Inc. and their contract biologist were observers at the meetings, to answer questions and supply additional information when necessary. The first meeting was to comment on an early draft, and to discuss methods of impact analysis and species of concern. The second meeting focused on the species and habitats identified as being impacted, the adequacy of information available, identifying specific impacts for each species and habitat, and deciding upon the significance of each impact. A third meeting was held prior to Draft release, to discuss proposed mitigation, monitoring its effectiveness, and residual impacts.

The result of this consultation and coordination process has been to keep communication open between more specialists from agencies than are present at Steering Committee meetings. Resource areas have been reviewed by several specialists from other agencies, which results in a more cohesive and widely understood document.

6.3 Consultation

This Project required consultation on three Federally listed species; Modoc sucker, Bald Eagle, and Peregrine Falcon; and one California species, the Greater sandhill crane. Consultation for the Federally listed species was with the United States Fish and Wildlife Service (USFWS). Consultation on the sandhill crane was with the CDFG. Consultation correspondence for the crane is included in Appendix N. The Biological Opinion for the Federally listed species is included in Appendix N.

6.3.1 Federal

Section 7 of the Endangered Species Act of 1973, as outlined in 50 Code of Federal Regulations (CFR) Part 402.04 states, formal consultation is initiated either by a Federal agency involved with a project or it may be requested by the USFWS. The process can be consolidated with interagency cooperation such as NEPA, but the formal review is independent of the EIS process. The Federal agency can ask for assistance from the USFWS to provide information and recommendations, and other sources can be used "to obtain the biological information necessary for a review of the effect an activity or program has upon listed species or their habitat." (50 CFR Part 402.04 [d]) A Biological Assessment (BA) is prepared on the listed species that could potentially be affected by the Project. When a written request for consultation is received a threshold examination is conducted. This examination includes a review of available information and possibly a site inspection. The Director then issues a written notification stating whether or not the activity is likely to jeopardize the species or its habitat, and provide recommendations for modifications to enhance conservation and protection of the species or its habitat. This is called the Biological Opinion (BO).

This Project required consultation on three federally listed species Modoc sucker, Bald Eagle, and Peregrine Falcon. The BO for these species is included in Appendix N. Bald eagle and peregrine falcon were included in the Consultation at the request of USFWS personnel. Sections 3.5 and 4.5.2 discuss the status, impacts and mitigation proposed for these species.

6.3.2 California

This Project required consultation on one California species, the Greater sandhill crane. Sandhill cranes have been observed near the Project site (Silva Flat Reservoir) and could be affected to some degree by Project activities. The BA for the Sandhill crane is included in Appendix N. The CDFG consultation process is similar to that of the USFWS outlined above. The desired result of any consultation process is to avoid impacts and loss of habitat.

CHAPTER 7.0

AGENCIES, ORGANIZATIONS, AND PERSONS CONTACTED OR CONSULTED

7.0 AGENCIES, ORGANIZATIONS, AND PERSONS CONTACTED OR CONSULTED

Mr. Jeffrey W. Todd	AMAX, Inc.	1626 Cole Blvd.	Golden, CO 80401	303/231-0675	AMAX, Inc.
Dr. C. Val Grant	Bio-Resources, Inc.	135 E. Center	Logan, UT 84321	801/753-5370	Consultant - Biological and Soils
Mr. Allen L. Jones	CA Div. Mines & Geology	650 Bercut Dr.	Sacramento, CA 95814	916/323-8559	State Mine Reclamation Program
Mr. Frank Hall	CA Dept. Fish and Game	728-600 Fish and Game Road	Wendel, CA 96130	916/254-6808	Local Wildlife
Mr. Tom Stone	CA Dept. Fish and Game	601 Locust St.	Redding, CA 96001	916/225-2300	Regional Wildlife
Mr. Phillip Woodward	CA Reg. Water Qual. Cnt. Bd.	415 Knoll Crest Drive	Redding, CA 96002	916/224-4845	Water and Waste; Central Valley
Mr. Paul Chappell	CA Dept. Fish and Game	728-600 Fish and Game Road	Wendel, CA 96130	916/254-6363	Local Fisheries
Ms. Gail A. Newton	CA Div. Mines & Geology	650 Bercut Dr.	Sacramento, CA 95814	916-323-8559	State Reclamation
Mr. Dennis C. Wilson	CA Reg. Water Qual. Cnt. Bd.	415 Knoll Crest Drive	Redding, CA 96002	916/224-4845	Water and Waste; Central Valley
Mr. Stan Haye	County Court House Assessor's Office	P. O. Box J 168 N. Edward	Independence, CA 93526	619/878-2411	CA/NV RCC Mining Committee
Ms. Barbara A. Files	Denver Knight Piesold	1600 Stout St., #800	Denver, CO 80202	303/825-6914	Consultant - Waste and Water
Mr. John T. Gormley	Denver Knight Piesold	1600 Stout St., #800	Denver, CO 80202	303/825-6914	Consultant - Waste and Water
Ofc of Fed Activities, E-3	EPA	215 Freemont St.	San Francisco, CA 64105		3 copies D-EIS
Mr. C. Ron Percivalle	Environmental Consultant	701 Terrace Street	Carson City, NV 89703	702/882-2353	Consultant - Environmental/Meteorologist
Dr. Peter Jensen	Jensen & Associates	9726 Lott Road	Durham, CA 95938	916/345-9515	Consultant - Archaeology, Cultural Resources
Dr. Bruce Brown	Knight and Piesold, Ltd.	409 Granville St., #1350	Vancouver, BC V6C 1T2	604/685-0543	Consultant - Geotech and Geochem
Mr. Ronald A. Otrin	Landowner	2601 N. Old Stage Rd., #30	Mt. Shasta, CA 96067		Landowner
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CHAPTER 8.0
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8.0 LIST OF PREPARERS

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CHAPTER 9.0
TERMS AND ABBREVIATIONS

9.0 TERMS AND ABBREVIATIONS

9.1 Terms/Glossary

A Horizon:	The layer of soil underlying the surface litter layer and overlying the more sterile B Horizon. Usually considered the top soil component. The organic components are usually decomposed beyond recognition.
Acid Rock Drainage:	The drainage that occurs as a result of the natural oxidation of sulphide minerals contained in rock which is exposed to air and water.
Adularia:	A moderate to low-temperature mineral of the alkali feldspar group.
Aerie:	The nest of a bird on a cliff or a mountaintop; a brood of birds of prey; an elevated dwelling, structure or position.
Agglomeration:	The process by which fine particles of crushed rock are bound to larger pieces of crushed rock so leach solutions may percolate through the layers of crushed, compacted material, to extract gold.
Ambient Noise Level:	The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.
Anastomosing:	Said of a leaf whose veins form a netlike pattern.
Andesite:	A dark-colored, fine-grained extrusive rock, when porphyritic, contains phenocrysts composed primarily of zoned sodic plagioclase and one or more of the mafic minerals (e.g., biotite, hornblende, pyroxene).
Animal Unit Month:	The amount of forage required by one cow and one 6-month old calf, or their equivalent, for one month. Approximately 1,000 pounds of air-dried feed.
Antennaria flagellaris:	Creeping pussytoes; a low plant, rarely found in California which prefers soils which are shallow to bedrock or have a hard duripan layer at a shallow depth.
Argillic:	Pertaining to clay or clay minerals. Certain minerals of a rock are converted to minerals of the clay group.

B Horizon:	The soil layer underlying the A Horizon. Usually contains very little organic matter and is lower in microbial activity than the O and A Horizons.
Background:	The area located from 3-5 miles to infinity from the viewer.
Barren Solution:	Non gold-bearing sodium or calcium cyanide solution.
Breccia:	A coarse-grained clastic rock, composed of angular broken rock fragments held together by a mineral cement or in a fine-grained matrix.
CNEL:	Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m. Note: L_{dn} represents daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.
Confined:	An aquifer where the groundwater is isolated from the atmosphere at the point of discharge by impermeable geologic formations; generally the groundwater is subject to pressure greater than atmospheric.
Conglomerate:	A coarse-grained clastic sedimentary rock, composed of rounded to sub-angular fragments larger than 2mm in diameter, set in a fine-grained matrix.
Cover:	The proportion of the ground occupied by a perpendicular projection to the ground from the outline of the aerial parts of the members of a plant species.
Dacite:	A fine-grained extrusive rock with the same general composition as andesite but having a less calcic plagioclase and more quartz.
Density:	The number of individuals in a given area. Expressed per unit area.
Diversity:	An expression of community structure. High if there are many equally abundant species; low if only a few equally abundant species.
Drawdown:	The distance between the static water level and the surface of the cone of depression.

Duripan:	A hardpan soil layer caused by silica induration.
Electrum:	A naturally occurring, deep yellow to pale yellow alloy of gold with silver.
Epiclastic:	A rock formed at the Earth's surface by consolidation of fragments of pre-existing rocks.
Epithermal:	A hydrothermal mineral deposit formed within about one kilometer of the Earth's surface and in the temperature range 50° - 200° C, occurring mainly as veins.
Felsite:	A general term for any light-colored, fine-grained or aphanitic extrusive or hypabyssal rock, with or without phenocrysts and composed chiefly of quartz and feldspar.
Forb:	Broadleafed, small plants composed of soft tissue; not woody material.
Foreground:	The detailed landscape found within 0 to 1/4 - 1/2 mile from the viewer.
Frequency:	The number of samples in which a plant or animal species occurs divided by the total number of samples.
Fugitive Dust:	Dust not caught by a capture system.
Geomorphic:	Relating to the classification, description, nature, origin, and development of present landforms and their relationships to underlying structures and of the history of geologic changes as recorded by these surface features.
Growth Media:	All materials; including topsoil, specified soil horizons, vegetative debris, and organic water, which are classified as suitable for stockpiling and reclamation retopsoiling.
Habitat:	Vegetation, terrain, shelter, and water that provide all of the life needs of a wildlife species.
Hazardous Substance:	Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive.

Hydraulic Gradient:	The rate of change in total head per unit of distance of flow in a given direction.
Hydraulic Conductivity:	The rate of flow of water in gallons per day through a cross section of one square foot under a unit hydraulic gradient, at the prevailing temperature.
Hydrophytic:	Water dependent or tolerating vegetation.
Hydrothermal Alteration:	Alteration of rocks or minerals by the reaction of hydrothermal water with pre-existing solid phases.
Illitic:	A mica-like clay mineral that is widely distributed in argillaceous sediments, especially marine shales and their soil derivatives.
Intercalated:	Material that exists or is introduced between layers of a different character.
Key Viewpoint:	The point(s) commonly in use or potentially in use where the view of a management activity is the most disclosing. The location which provide the means of studying the visual impact of alternatives to the landscape.
Landscape:	The sum total of the characteristics that distinguish a certain area on the earth's surface from other areas. These characteristics are a result not only of natural forces but of human occupancy and use of the land.
L_{dn}:	Day-Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m. Note: L_{dn} represents daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.
Lek:	A communal mating area used by sage grouse (and some other grouse) where adult males display and compete for females. Sage grouse use open sites, often near water sources. These areas are also referred to as strutting grounds.
L_{eq}:	Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1,8 and 24-hour sample periods.

Lithics:	Made from stone, particularly as applied to the production and manufacture of stone tools.
Lixiviant:	A substance used to dissolve a solid.
L_{max}:	The maximum sound level recorded during a noise event.
L_n:	The sound level exceeded in "n" percent of the time during a sample interval. L_{10} equals the level exceeded 10 percent of the time (L_{90}, L_{50}, etc.)
Mafic:	An igneous rock composed chiefly of one or more ferromagnesian, dark-colored minerals in its mode.
Management Activity:	An activity of man imposed on a landscape for the purpose of harvesting, traversing, transporting, or replenishing natural resources.
Middleground:	The area located from 1/4 - 1/2 to 3-5 miles from the viewer.
Miocene:	An epoch of the upper Tertiary period, after the Oligocene and before the Pliocene; also corresponds to a worldwide series of rocks.
Modification:	A visual quality objective meaning man's activities may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.
Noise Exposure Contours:	Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and L_{dn} contours are frequently utilized to describe community exposure to noise.
Normal Fault:	A fault in which the hanging wall appears to have moved downward relative to the footwall.
O Horizon:	The uppermost soil layer. Composed of decomposed organic materials, some of which are still recognizable. Overlies the A Horizon. Contains most of the microbial constituents found to be beneficial to plant life and normal soil ecology.

Old Growth Forest:	A forest in which the average diameter at breast height (dbh) is greater than 24 inches. The average conifer crown diameter is 24 feet or greater. The canopy is multilayered and the total canopy closure exceeds 60 percent.
Opacity:	The amount of light obscured by particulate pollution in the air; clear window pane glass has a zero opacity; a brick wall has 100 percent opacity.
Ore:	A mineral of sufficient value as to quality and quantity which may be mined at a profit.
Partial Retention:	A visual quality objective which in general means man's activities may be evident but must remain subordinate to the characteristic landscape.
Patented Claims:	Mining claims for which the U.S. government has conveyed the fee simple interest in the surface and minerals into private ownership.
Pasquill Stability Classes:	An atmospheric classification system which characterizes the stability of the atmosphere based on such factors as surface temperature, wind velocity, surface roughness, and solar radiation. There are six classes: A-F. A is very unstable (high winds, varying temperatures, etc.) through F, which is very stable (calm, constant temperature, etc.)
Perched Water:	Unconfined groundwater separated from an underlying main body of groundwater by an unsaturated zone; usually not an aquifer.
Percolation/Infiltration:	The act of water seeping or filtering through the soil without a definite channel.
Permeability:	The property or capacity of a porous rock, sediment, or soil for transmitting a fluid; it is a measure of the relative ease of fluid flow under unequal pressure.
Playa:	A dry, flat area at the lowest part of an undrained desert basin, underlain by stratified clays, silt or sand, and commonly by soluble salts.
Pliocene:	An epoch of the Tertiary period, after the Miocene and before the Pleistocene; also corresponds to a worldwide series of rocks.

Plot:	A square area, usually 1/4 to 1 square meter, of terrain in which all individuals are counted and measured.
Porosity:	The percentage of the bulk volume of rock or soil that is occupied by interstices, whether isolated or connected.
Potentiometric Surface:	An imaginary surface representing the total head of groundwater in a confined aquifer that is defined by the level to which water will rise in a well. (Loosely, the water table).
Pregnant Solution:	A gold-bearing, water based sodium or calcium cyanide fluid which contains sufficient quantities of gold that it can be sent to the processing plant for gold recovery.
Propylitic:	A hydrothermally altered andesite resembling greenstone.
Protore:	A primary material that cannot be produced at a profit under existing conditions but that may become profitable with technological advances or price increases.
Pumiceous:	The texture of a pyroclastic rock characterized by numerous small cavaties presenting a spongy, frothy appearance.
Pyroclastic:	Pertaining to clastic rock material formed by volcanic explosion or aerial expulsion from a volcanic vent; also pertaining to rock texture of explosive origin.
Recharge:	The addition of water to the zone of saturation; also, the amount of water added.
Retention:	A visual quality objective which in general means man's activities are not evident to the casual forest visitor.
Riparian:	Of, pertaining to, situated or dwelling on the bank of a river or other body of water.
Reverse Circulation:	A rotary drilling method whereby drill cuttings and fluids are circulated through the inside of the drilling pipe. This method is good for large diameter boreholes and drilling in unconsolidated formations.

Ringlemann Number:	A number designation of a series of shaded illustrations used to measure the opacity of air pollution emissions. The chart ranges from light gray to black and is used to set and enforce emissions standards.
Scenic Quality:	The degree of harmony, contrast, and variety within a landscape; the overall impression retained after driving through, walking through, or flying over an area of land and/or water.
SEL or SENEL:	Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound level for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.
Sericitic/Sericite:	A white, fine-grained potassium mica occurring in small scales and flakes as an alteration product of various aluminosilicate minerals.
Silicic:	A silica-rich igneous rock or magma. A rock or magma generally contained free silica in the form of quartz.
Silicification:	The introduction of, or replacement by silica, generally resulting in the formation of fine-grained quartz, chalcedony or opal, which may fill pores and replace existing minerals.
Solifluction:	The slow, viscous downslope flow of water logged soil and other unsorted and saturated surficial materials.
Sound Level:	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.
Specific Capacity:	The rate of discharge of a water well per unit of drawdown, commonly expressed in gpm/ft. It varies with duration of discharge.
Stockwork:	A mineral deposit consisting of a three-dimensional network of planar to irregular veinlets closely enough spaced that the whole mass can be mined.

Storage Coefficient:	The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head.
Stratiform:	A special strata-bound deposit in which desired rock or ore is coextensive with one or more sedimentary, metamorphic or igneous layers.
Strutting Grounds:	See lek.
Texture:	The visual or tactile surface characteristics of something.
Thiourea:	A solvent used for the extraction of metals from finely crushed ores.
Transect:	A long strip or belt of terrain in which all individuals are counted and measured.
Transmissivity:	The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient.
Tuff:	A general term for all consolidated pyroclastic rocks. (Tuffaceous)
Tuffaceous:	See Tuff.
Unconfined:	An aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.
Understory:	The layer of vegetational growth underlying the upper tree canopy . Usually composed of small shrubs, grasses and forbs.
Variety Class:	A rating system that classifies the landscape into different degrees of variety. This determines those landscapes which are most important and those which are of lesser value from the standpoint of scenic quality.
Vent:	The opening at the Earth's surface through which volcanic materials are extruded.
Visual Absorption Capability:	The physical capacity of a landscape to screen proposed development and still maintain its inherent visual character.

Visual Landscape Character (Characteristic Landscape):	The overall impression created by a landscape's unique combination of visual features (such as land, vegetation, water, structures) as seen in terms of form, line, color, and texture.
Visual Management System:	The system devised by the USFS in the early 1970's to incorporate visual values into their forest management system. It involves classifying landscapes, determining visual objectives, understanding how much change a landscape can absorb, and mitigating impacts so that visual quality objectives are met.
Visual Quality Objective:	Degree of acceptable alteration of the natural landscape. These include retention, partial retention, modification.
Visual Resource(s):	Those natural and cultural features of the environment which can potentially be viewed.
Visual Sensitivity Levels:	A three-level rating system used to delineate areas receiving different amounts of exposure (present or potential) to user groups with differing attitudes towards changes in scenic quality. When combined with distance zones and Variety Class, make up Visual Quality Objectives.
Volcaniclastic:	A clastic rock containing volcanic material in whatever proportion, and without regard to its origin or environment.
Welded:	Consolidation of sediments by pressure from overburden material or earth movement.

9.2 Abbreviations

ABBREVIATION	DEFINITION
ABA	acid/base accounting
ACHP	Advisory Council on Historic Preservation
ADA	Average Daily Attendance

ABBREVIATION	DEFINITION
ADT	average daily trips
AGI	Amax Gold, Incorporated
AGP	acid generation potential
AMAX	AMAX, Incorporated
AMP	Allotment Management Plan
ANFO	Ammonium Nitrate and Fuel Oil
APCD	Lassen Air Pollution Control District
APE	Area of potential effect
ARB	California Air Resources Board
ARD	Acid Rock Drainage
ARPA	Archaeological Resources Protection Act
ASAF	US Air Force
ATC	Authority to Construct
AUM	Animal Unit Month
AWC	Available Water-holding Capacity
BACT	Best Available Control Technology
BAT	Best Available Technology
BATF	Bureau of Alcohol Tobacco and Firearms
BGS	below ground surface
BLM	Bureau of Land Management
BMP	Best Management Practices
BPA	Bonneville Power Administration
CAA	Clean Air Act
CAC	California Administrative Code
Caltrans	California Department of Transportation
CARIDAP	California Archaeological Resource Identification and Data Acquision Program
CDFFP	California Department of Forestry and Fire Protection
CDFG	California Department of Fish and Game
CEQ	Council of Environmental Quality
CEQA	California Environmental Quality Act of 1970 as amended
CFR	Code of Federal Regulations, 1987
CIP	Carbon-in-Pulp
cm/sec	centimeters per second
CNPS	California Native Plant Society
CPE	Corrugated Polyethylene Pipe
CO	carbon monoxide

ABBREVIATION	DEFINITION
COA	Conditions of Approval
COLA	cost of living adjustments
CRWQCB	California Central Valley Regional Water Quality Control Board
CUP	Conditional Use Permit
CWA	Clean Water Act
CWE	cumulative watershed effects
dB, dBA	Decibels
dbh	Diameter at Breast Height
dBl$_{eq}$	Average Noise Level in Decibels
DKP	Denver Knight Piesold, Inc.
DRI	Desert Research Institute
EA	Environmental Assessment
EDD	Employment Development Department
EIR/EIS	Environmental Impact Report/ Environmental Impact Statement
EPA	Environmental Protection Agency
ERA	Equivalent Roaded Acres
ERP	Emergency Response Plan
ESA	Endangered Species Act
FES	Fishman Environmental Service
FLPMA	Federal Land Policy and Management Act
ft^2	square feet
FTE	Full Time Equivalents
GAO	General Accounting Office
g	gravity (acceleration = 32.2 ft/sec^2)
gpd	gallons per day
gpm	gallon per minute
GEI	Geochemical Engineering, Inc.
GSCP	Geochemical Sampling and Contingency Plan
HABS	Historic American Buildings Survey
HCl	Hydrochloric Acid
HCN	Hydrogen Cyanide
HDPE	High Density Polyethelene
HHOC	Hayden Hill Operating Company, Inc.
HMMP	Habitat Mitigation and Management Plan
H_2S	hydrogen sulfide
HSI	Hydro-Search, Inc.

ABBREVIATION	DEFINITION
ICOS	Issues, Concerns, and Opportunities
kg	kilogram
KP	Knight and Piesold, Ltd.
Kt	Kiloton
KV	Kilovolt
KVA	Kilovolt Amperes
KW	Kilowatt
LAFCO	Local Agency Formation Commission
LCAPCD	Lassen County Air Pollution Control District
LCRS	Leachate Collection and Return System
Ldn	Day-night Average Level
LGMI	Lassen Gold Mining, Incorporated
LMP	Land Mangement Plan
LOS	level of service
m	meter
MBTA	Migratory Bird Treaty Act
MCC	Mitigation Compliance Coordinator
MCP	Mitigation Compliance Program
mg/m^3	milligrams per cubic meter
mm	millimeter
MRI	Materials Resource Inventory
msl	mean sea level
$\mu g/m^3$	micrograms per cubic meter
μm	micrometers
mg	milligram
mgd	million gallons per day
MIS	management indicator species
MNF	Modoc National Forest
MOU	Memorandum of Understanding
MSHA	Mine Safety and Health Administration
mt	million tons
NAAQS	National Ambient Air Quality Standards
NaOH	Sodium Hydroxide
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NNP	net neutralization potential

ABBREVIATION	DEFINITION
NOI	Notice of Intent
NOP	Notice of Preparation
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NYSE	New York Stock Exchange
OSHA	Occupational Safety and Health Administration
OSM	Office of Surface Mining
O_3	Ozone
opr	ounces per ton
Pb	Lead
pcf	pounds per cubic foot
PLWMA	Private Lands Wildlife Management Area
PM10	Particulates less than 10 micrometers in aerodynamic diameter
POO	Plan of Operation
ppa	plants per acre
ppm	parts per million
Project	proposed Hayden Hill gold mining project
psf	pounds per square foot
PTO	Permit to Operate
RCD	U.S.D.A. Soil Conservation Service, Pit Resource Conservation District
RFP	Request for Proposals
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right of way
RP	Reclamation Plan
RQD	rock quality designation
SAB	State Allocation Board
SCS	Soil Conservation Service
SF	safety factor
SHPO	State Historic Preservation Office
SMARA	Surface Mining and Reclamation Act of 1975
SO_x	sulphur oxides
SPCC	Spill Prevention, Containment and Control Plan
SPT	Standard Penetration Test
SRK	Steffen Robertson and Kirsten, (U.S.), Inc.

ABBREVIATION	DEFINITION
STLC	Soluble Threshold Limit Concentration
SVEC	Surprise Valley Electrification Corporation
tpd	tons per day
TOC	thresholds of concern
TTLC	Total Threshold Limit Concentration
U.S.	United States
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service-Modoc National Forest
USFWS	US Fish and Wildlife Service
USGAO	United States General Accounting Office
USGS	United States Geological Survey
USLE	Universal Soil Loss Equation
VAC	Visual Absorption Capability
VLDPE	Very Low Density Polyethylene
VQO	Visual Quality Objective
WAD	Weak Acid Dissociable
WCRM	Western Cultural Resource Management
WQCB	Water Quality Control Board

CHAPTER 10.0
REFERENCES

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